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FM 6-75

WAR DEPARTMENT FIELD MANUAL

SERVICE OF THE PIECE

105-MM HOWITZER M2

TRUCK-DRAWN

and TRACTOR-DRAWN

WAR DEPARTMENT • OCTOBER 1945

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This manual supersedes FM 6-75, 12 December 1941, including C 1, 23 May 1942; C 2, 29 June 1943; C 3, 3 September 1943; C 4, 15 October 1943; and C 5, 25 October 1944.

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United States Government Printing Office

Washington : 1945

WAR DEPARTMENT

WASHINGTON 25, D. C., 5 October 1945

FM 6–75, Service of the Piece, 105-mm Howitzer M2, Truck-drawn and Tractor-drawn, is published for the information and guidance of all concerned.

[AG 300.7 (25 Sep 45)]

BY ORDER OF THE SECRETARY OF WAR:

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AAF (5); AGF (40); ASF (2); Arm & Sv Bd (1); PG 9 (2); Gen & Sp Sv Sch (2) except 6 (500); USMA (5); RTC 6 (100); A (2); CHQ (2); D (5) except 1 (0); B 6 (2); R 6 (2). T/O & E: 6–26 (25); 6–26–OS (25); Special distribution.

Refer to FM 21–6 for explanation of distribution formula.

CONTENTS

Figure 1. 105-mm howitzer M2A1 and truck, 2½-ton, 6 x 6.

This manual supersedes FM 6–75, 12 December 1941, including C 1, 23 May 1942; C 2, 29 June 1943; C 3, 3 September 1943; C 4, 15 October 1943; and C 5, 25 October 1944.

CHAPTER 1

GENERAL

1. **PURPOSE AND SCOPE.** This manual prescribes the duties to be performed in the service of the piece by the personnel normally assigned to one howitzer section of the firing battery.

2. **REFERENCES.** **a. Description, operation, functioning, and care of matériel.** (1) *Howitzer.* TM 9–325; SNL C–21.

(2) *Truck.* TM 9–801; SNL G–508.

(3) *Tractor.* . . TM 9–786; SNL G–162.

b. Description and operation of fire control and sighting equipment. TM 9–325; SNL F–1.

c. Ammunition. TM 9–325, 9–1900, 9–1901; SNL R–1.

d. Cleaning and preserving materials. TM 9–850; SNL K–1.

e. Vehicle driver. FM 25–10; TM 21–300; TM 21–301; TM 21–305.

f. Maneuvers of battery. FM 6–101.

g. Safety precautions in firing. AR 750–10; FM 6–40; FM 6–140 (when published).

h. Firing battery. FM 6–140.

i. Gunnery. FM 6–40.

j. Reconnaissance, occupation, and organization of position. FM 6–101; FM 6–140.

Note. For military terms not defined in this manual, see TM 20–205; for list of training publications, see FM 21–6; for training films, film strips, and film bulletins, see FM 21–7; for training aids, see FM 21–8.

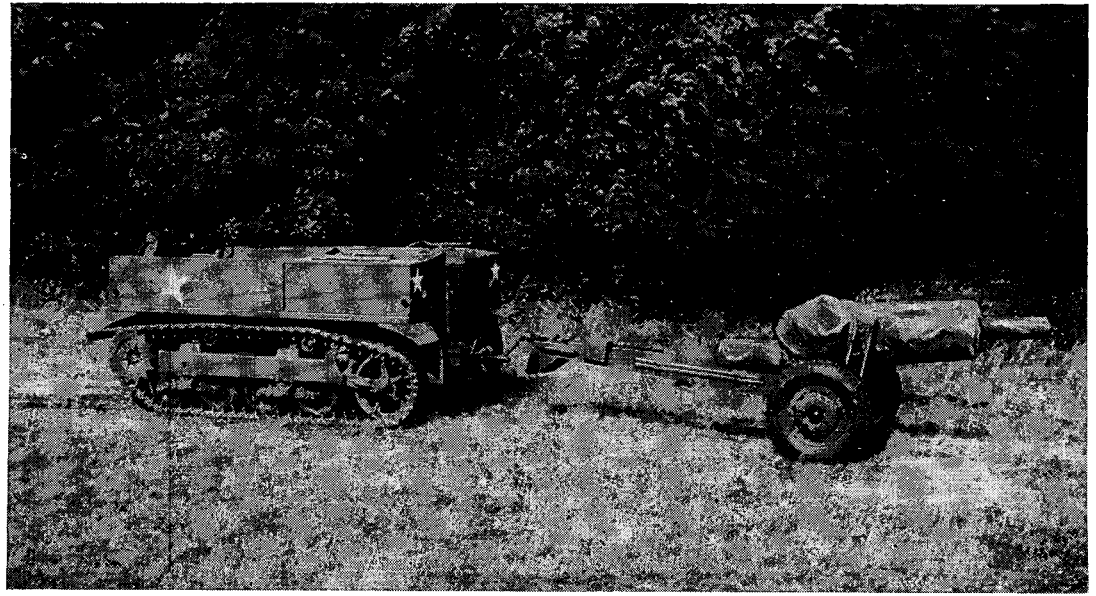

Figure 2. 105-mm howitzer M2A1 and tractor, 13-ton, M5.

3. **DEFINITIONS AND TERMS.** **a. Section.** Tables of Organization and Equipment prescribe the personnel and material comprising a section of a battery. In this manual, the term is often used to designate the personnel required to serve one piece and the matériel of the section. In a restricted sense, the term section may be used to designate *only the personnel* of a section.

b. Coupled. A piece is said to be coupled when its lunette is attached to the pintle of its prime mover. (See figs. 1 and 2.)

c. Uncoupled. A piece is uncoupled when its lunette is detached from the pintle of its prime mover.

d. Front. The front in a section, pieces coupled, is the direction in which the prime mover is headed; pieces uncoupled, the front is the direction in which the muzzle points. However, for determining the right or left of the piece, coupled or uncoupled, the front is the direction in which the muzzle points.

e. Right (left). The direction right (*left*) is the right (*left*) of one facing the front.

f. In battery. A howitzer is said to be in battery when its tube is in normal firing position.

CHAPTER 2

ORGANIZATION

4. **COMPOSITION.** **a. Howitzer section.** A howitzer section consists of a chief of section, a howitzer squad, and a driver. Any additional cannoneers (assigned or attached) act as reliefs or are assigned to other duties as the chief of section may direct. When the section uncouples for drill or for firing, the chief of section remains at the position of the piece and commands the howitzer squad.

b. Howitzer squad. The gunner and seven cannoneers numbered from 1 to 7, who serve the piece, are for purposes of convenience referred to as the howitzer squad.

c. Ammunition section. The ammunition section consists of the chief of section, machine gun personnel, ammunition handlers, and the drivers of the ammunition vehicles of the ammunition (fifth) section.

5. **FORMATION.** **a. Order of formation.** A howitzer squad is formed as shown in figure 3. Higher-numbered cannoneers, if present, form in order on the left of No. 7.

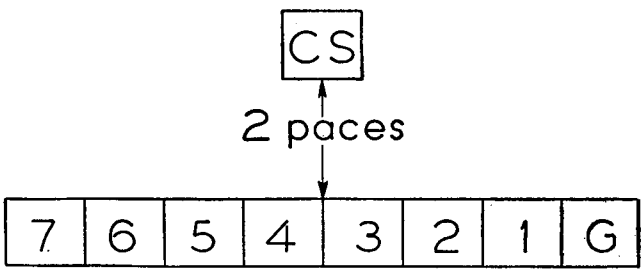

Figure 3. Formation of howitzer squad.

b. To form. (1) The place of formation is indicated and the commands given thus, for example: 1. IN FRONT (REAR) OF YOUR PIECES, or 1. ON THE ROAD FACING THE PARK, 2. FALL IN. Each gunner repeats the command FALL IN

and hastens to place himself, faced in the proper direction, at the point where the right of his squad is to rest. The cannoneers move in double time and assemble at attention in their proper places. For the first formation of the howitzer squads for any drill or exercises, the caution, "As howitzer squads," precedes the command. The chief of section, if present, supervises the formation.

(2) In case the front or rear of the piece is designated, each squad falls in at its post (par. 6).

c. To call off. (1) The command is: CALL OFF. The cannoneer on the left of the gunner calls off "One"; the cannoneer on the left of No. 1, "Two"; and so on.

(2) After having called off, if a subsequent formation is ordered, the cannoneers fall in at once in their proper order.

CHAPTER 3

POSTS: MOUNTING AND DISMOUNTING

6. **POSTS OF HOWITZER SQUADS. a. Pieces coupled.** (1) *In front of piece.* The squad is in line facing to the front, its center 2 paces from the front of the prime mover.

(2) *In rear of piece.* The squad is in line facing to the front, its center 2 paces from the muzzle of the piece.

b. Pieces uncoupled. *In rear of piece.* The squad is in line facing to the front, its center 2 paces from the end of the trails.

7. **TO POST HOWITZER SQUADS.** The squads, having been marched to the vicinity of the pieces, are posted at the command SQUADS IN FRONT (REAR) OF YOUR PIECES. Each gunner marches his squad to its piece and posts it in the position indicated.

8. **POSTS OF CANNONEERS. a. Pieces coupled.** The cannoneers of the howitzer squad are posted as shown in figure 4. All are 2 feet outside the wheels and facing to the front. Higher-numbered cannoneers, if present, are posted as prescribed by the chief of section.

b. Pieces uncoupled. See paragraph 17 and figures 10 and 11.

9. **TO POST CANNONEERS. a.** The commands are: 1. CANNONEERS, 2. POSTS. Each gunner repeats the command POSTS. The cannoneers move in double time to their posts.

b. For preliminary instruction, the squads on entering the park are first posted with their pieces, and cannoneers are then sent to their posts by the foregoing command. The command is general, however, and is applicable when the cannoneers are in or out of ranks, at a halt or marching, and when the pieces are coupled or uncoupled.

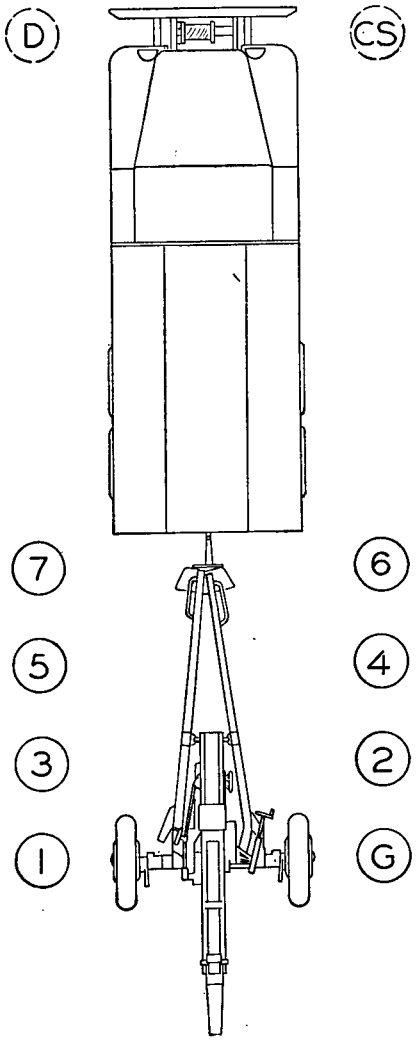

Figure 4. Posts of cannoneers, howitzer coupled.

10. TO MOUNT. a. The commands are: 1. CANNONEERS, PREPARE TO MOUNT, 2. MOUNT.

(1) *When a truck is used as prime mover.* At the first command, cannoneers move in double time to positions shown in figure 4. At the second command, each cannoneer at the right rear of the truck will, in turn, place his right foot on the right rear bumper and, grasping the step on the tail gate with his right hand, will swing his left leg over the gate into the body of the truck. Each cannoneer on the left will place his left foot on the left rear bumper and, grasping the step with his left hand, will swing his right leg over the gate into the body of the truck. The cannoneers take seats as indicated in figure 5. If the chief of section and driver are to be included in the movement, the commands are: 1. PREPARE TO MOUNT, 2. MOUNT. At the first command, the driver and chief of section take position on the left and right of the rear of the truck, respectively. After the last cannoneer has mounted, the driver fastens the safety strap; the chief of section and driver mount, take seats, and close their doors.

(2) *When medium tractor M5 is used as prime mover.* At the first command, the driver takes position directly in front of the right door, opens it, and faces to the rear holding the door. The chief of section opens the left door and takes position 4 feet in front of it facing to the rear. At the second command, the gunner and cannoneers Nos. 1 to 6, inclusive, on their respective sides, will in turn step on the footrest on the bumper and grasp the hand grips located on the body of the tractor (or the grips on the windshield when down). They will then step up into the body of the tractor and take seats as indicated in figure 6. The gunner closes the right door and the chief of section the left door when all personnel are seated. Cannoneer No. 7 moves double time to the executive's truck and mounts. If the chief of section and driver are to be included in the movement, the commands are: 1. PREPARE TO MOUNT, 2. MOUNT.

b. If the commands are: 1. CANNONEERS, 2. MOUNT, the cannoneers execute, at the command MOUNT, all that has been prescribed for the commands CANNONEERS, PREPARE TO

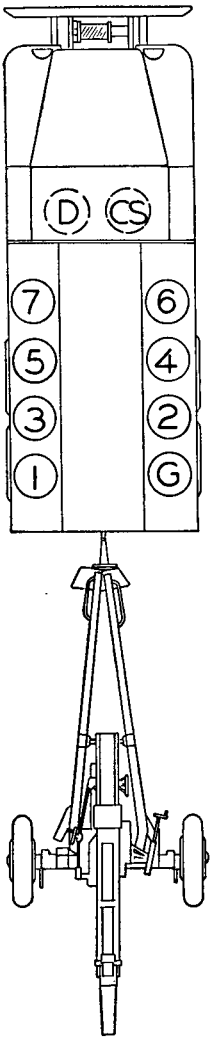

Figure 5. Posts of cannoneers mounted in truck.

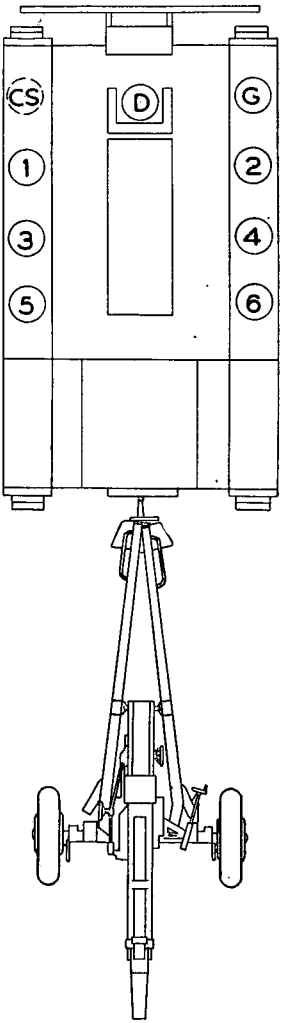

Figure 6. Posts of cannoneers mounted in tractor.

MOUNT and MOUNT. If all personnel of the section are to be included in this movement, the command is: MOUNT.

11. TO DISMOUNT. **a.** The commands are: CANNONEERS, PREPARE TO DISMOUNT, 2. DISMOUNT. At the first command, cannoneers assume positions from which they can dismount promptly; at the second command, they jump to the ground and take their posts in double time. If the chief of section and driver are to be included in this movement, the commands are: 1. PREPARE TO DISMOUNT, 2. DISMOUNT.

b. If the commands are: 1. CANNONEERS, 2. DISMOUNT, the cannoneers execute, at the command DISMOUNT, all that has been prescribed for the commands CANNONEERS, PREPARE TO DISMOUNT and DISMOUNT. If the chief of section and driver are to be included in this movement, the command is: DISMOUNT.

CHAPTER 4

MOVEMENTS OF PIECES BY HAND

12. **COUPLED.** The pieces are not moved by hand when coupled.

13. **UNCOUPLED.** a. The commands are: 1. PIECES FORWARD (BACKWARD), 2. MARCH. At the first command, the gunner and No. 1 remove the trail lock pins and place them in the traveling positions. Nos. 2 and 6 on the left trail and Nos. 3 and 7 on the right trail manipulate the trails as directed by No. 4 so that the axle locks may be locked by Nos. 4 and 5, working on the left and right, respectively. Nos. 2, 3, 6, and 7 close the trails, and No. 6, assisted by No. 7, fastens the trail lock. Nos. 4 and 5 release the hand brakes. Nos. 2 and 6 and Nos. 3 and 7 then grasp the trail handles on the left and right, respectively. No. 4 grasps the left wheel, No. 5 the right wheel. The gunner and No. 1 place themselves advantageously at the breech of the piece in moving forward; at the muzzle in moving backward. Higher-numbered cannoneers, if present, are employed as directed by the chief of section. If the situation requires additional manpower, Nos. 4 and 5, under the direction of the chief of section, will obtain ropes from section equipment in the prime mover and attach them to the hooks on the left and right axles, respectively. Personnel designated by the battery executive to assist in the movement of the piece will take position and pull on the ropes as directed by the chief of section.

b. At the command MARCH, all move the piece forward (backward) under the direction of the chief of section. When the piece is being moved up or down steep slopes, Nos. 4 and 5 assist by alternately setting and releasing the left and right brakes, thus permitting the piece to be pivoted about the alternately locked wheels. At the command HALT, the piece is stopped and reestablished in the firing position; all resume their posts (par. 17).

CHAPTER 5

UNCOUPLING AND COUPLING

14. **UNCOUPLING** (fig. 7). **a. General.** At drills, prime movers are posted as directed by the battery commander. In combat and in instruction simulating it, the prime movers are conducted by the first sergeant to a place previously designated by the battery commander; there they are disposed so as to take the best advantage of cover and concealment. If no cover and concealment are available, the prime movers are located in rear of either flank, faced to the front, with wide intervals between them.

b. To fire to front. The command is: ACTION FRONT. If marching, the prime movers halt at the command or signal. The cannoneers, if mounted, dismount after the prime movers have halted.

(1) *Pieces.* The gunner and No. 1 hasten to the wheels nearest their respective posts. Nos. 2, 3, 6, and 7 hasten to the trail handles, even-numbered cannoneers on the right, odd-numbered on the left. Nos. 4 and 5 go to the muzzle of the piece and assist by placing their weight on the tube. No. 2 unlatches the pintle and, assisted by Nos. 3, 6, and 7, raises the trails from the pintle; No. 4 sets the left hand brake. Nos. 2, 3, 4, 5, 6, and 7 swing the piece 180° clockwise. During this operation, No. 3 releases the drawbar lock and turns the drawbar 180°, latching it in the firing position. Nos. 2, 3, 6, and 7 then lower the trails to the ground. No. 5 sets the right hand brake. The gunner and all cannoneers then unload the ammunition, tools, and accessories and arrange them in an orderly and convenient manner to the left of the piece (when the truck is used as the prime mover, the driver lowers the tail gate prior to the unloading). When the unloading has been completed, the chief of section commands or signals DRIVE ON. The cannoneers take their posts (par. 17 and fig. 10).

Figure 7. Uncoupling the howitzer.

(2) *Prime movers.* At the command DRIVE ON, the prime movers move out and are conducted by the first sergeant to their previously designated position.

c. To fire to rear. The command is: ACTION REAR. The movement is executed according to the principles of ACTION FRONT. The piece is not turned after uncoupling.

d. To fire to flank. The command is: ACTION RIGHT (LEFT). The movement is executed according to the principles of ACTION FRONT, with the following modifications: after the piece is uncoupled, the trail is turned 90° away from the direction of fire, and the piece is run forward sufficiently to clear the track made by the prime mover; articles unloaded from the prime mover are placed on the ground so as to clear the track made by the prime mover.

15. **COUPLING.** a. The pieces being in position and in march order, the command is: COUPLE. The prime movers, under the command of the first sergeant, approach the position from the right (left) flank. As each prime mover approaches its piece, it turns to the left (right) and halts in prolongation of the trails of the piece.

b. All cannoneers working together under the direction of the chief of section load the tools, accessories, and unexpended ammunition. Nos. 2, 3, 6, and 7 hasten to the trail handles, even-numbered cannoneers on the left, odd-numbered on the right. Nos. 4 and 5 hasten to the front of the piece and release the brakes. The prime mover, upon signal from the chief of section, is maneuvered backward until the pintle is almost over the lunette. Nos. 2, 3, 6, and 7 then raise the trails and, after No. 3 has placed the drawbar in traveling position, place the lunette over the pintle, No. 2 latching the pintle. Nos. 4 and 5 assist by placing their weight on the tube. All cannoneers take their posts (fig. 4).

CHAPTER 6

PREPARE FOR ACTION AND MARCH ORDER

16. TO PREPARE FOR ACTION (figs. 8 and 9.) a. The piece being in position uncoupled, the command is: PREPARE FOR ACTION. Duties of individuals are as follows (on completion of his duties, each cannoneer takes his post (fig. 11)):

(1) *Chief of section.* (*a*) Supervises the work of the cannoneers.

(*b*) Inspects the matériel; verifies the fact that the recoil mechanism contains the proper amount of oil and that all is in order; and, when the operations have been completed, reports to the executive, "Sir, No. (so-and-so) in order," or reports any defects that the section cannot remedy without delay.

(2) *Gunner.* (*a*) Assisted by No. 1, removes the breech end of the howitzer cover.

(*b*) Removes the panoramic telescope from its case and seats it in the telescope mount.

(*c*) Places the left trail lock pin in the firing position.

(*d*) Uncovers the telescope mount bubbles; sets the index of the rotating head at zero, the deflection at zero, and centers both bubbles.

(3) *No. 1.* (*a*) Assists the gunner in removing the breech end of the howitzer cover, throwing the cover to the right of the right wheel.

(*b*) Places the right trail lock pin in the firing position.

(*c*) Operates elevating handwheel to assist No. 4 in unlocking cradle lock.

(*d*) Uncovers the range quadrant bubbles; sets site 300 and centers the bubbles.

(*e*) Operates the breech mechanism and examines the breechblock, chamber, and bore, cleaning any parts requiring it; leaves the breech open.

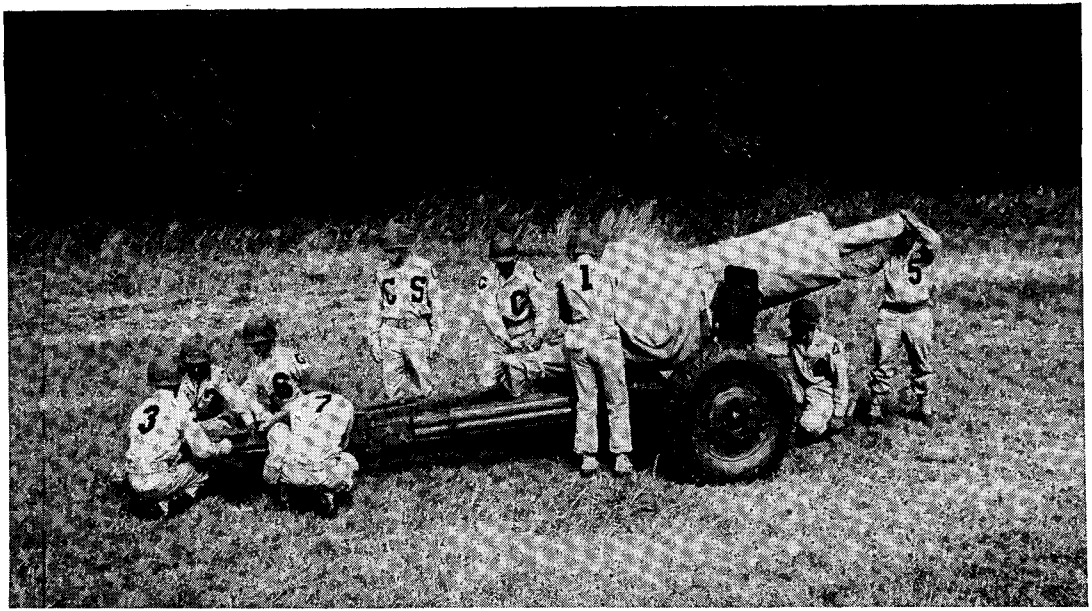

Figure 8. Squad preparing for action, before trails are spread.

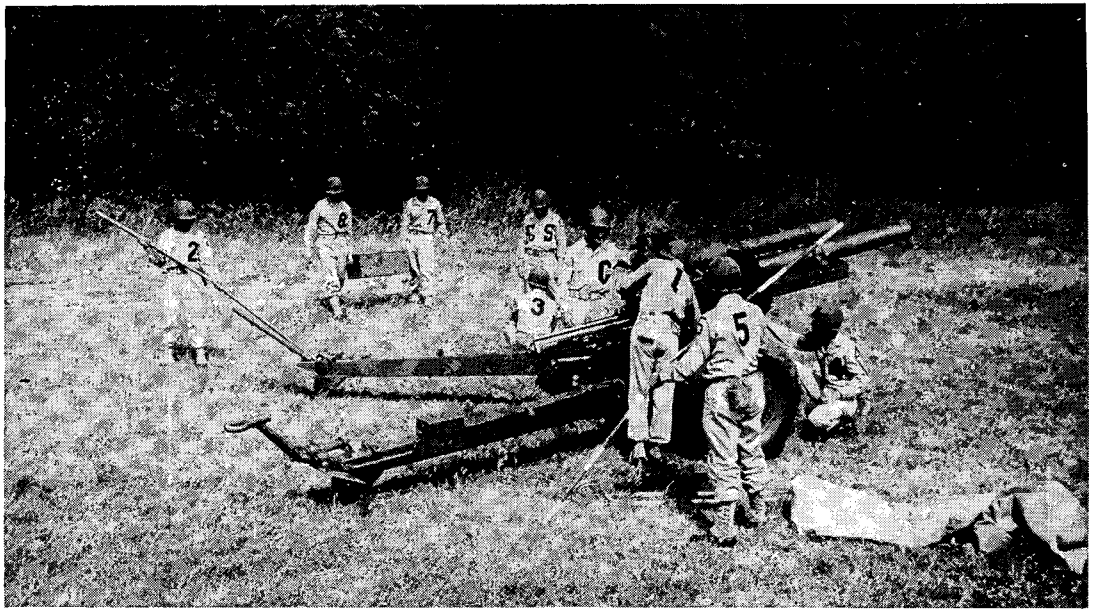

Figure 9. Squad preparing for action, after trails are spread.

(*f*) When so directed by the executive, removes the elbow telescope from its case and seats it in its mount.

(4) *No. 2.* (*a*) Spreads the left trail, assisted by No. 6, when No. 4 calls "Spread."

(*b*) Removes the rammer staff from its traveling position, assembles it to the rammer (bore brush), and places it to the right of the piece.

(*c*) When so directed, assists No. 1 in cleaning the breech mechanism, chamber, and bore of the howitzer.

(*d*) Folds the muzzle and breech ends of the howitzer cover and places them on the ground to the right of the right wheel of the howitzer.

(5) *No. 3.* (*a*) Spreads the right trail, assisted by No. 7, when No. 4 calls "Spread."

(*b*) Arranges the ammunition and tools, assisted by Nos. 4, 5, 6, and 7.

(*c*) Obtains the fuze setter from the section chest, and places it convenient to the position of the ammunition.

(6) *No. 4.* (*a*) Unlocks and lowers bottom shield flap, assisted by No. 5.

(*b*) Unlocks the left axle lock from the traveling position and latches it in the firing position; when he sees that both axle locks are unlocked, calls "Spread," to inform Nos. 2 and 3 that trails may be spread.

(*c*) Releases the left hand brake momentarily while trails are being spread.

(*d*) Unlocks the cradle lock, assisted by the operation of the elevating handwheel by No. 1, and latches it in the firing position.

(*e*) Removes the muzzle end of the howitzer cover, assisted by No. 5.

(*f*) Assists No. 3 in arranging the ammunition and tools.

(7) *No. 5.* (*a*) Assists No. 4 in unlocking and lowering bottom shield flap.

(*b*) Unlocks the right axle lock from the traveling position and latches it in the firing position.

(*c*) Releases the right hand brake momentarily while trails are being spread.

(*d*) Assists No. 4 to remove the muzzle end of the howitzer cover and throws it on the ground to the right of the right wheel.

(*e*) When directed by the chief of section, removes the aiming posts from the traveling position, assembles them, and sets them out.

(*f*) Assists No. 3 in arranging ammunition and tools.

(8) *No. 6.* (*a*) Unlocks the trail lock.

(*b*) Removes the trail handspike from its traveling position and places it in its socket on the left trail.

(*c*) Assists No. 2 in spreading the left trail.

(*d*) Assisted by No. 7, places the section chest immediately to the left of the piece.

(*e*) Assists No. 3 in arranging the ammunition and tools.

(*f*) Distributes waste to the cannoneers.

(9) *No. 7.* (*a*) Assists No. 3 to spread the right trail.

(*b*) Assists No. 6 to place the section chest to the left of the piece.

(*c*) Assists No. 3 in arranging the ammunition and tools.

b. If PREPARE FOR ACTION has not been ordered before the piece is established in the firing position, the command is habitually given by the chief of section as soon as the piece has been uncoupled. If this is not desired, the caution, "Do not prepare for action," must be given.

17. POSTS OF CANNONEERS, PIECE UNCOUPLED. **a.** The piece having been uncoupled but not prepared for action, posts of cannoneers are as in figure 10.

b. The piece having been uncoupled and prepared for action, posts are taken as follows (fig. 11):

(1) *Chief of section.* The chief of section goes where he can control the service of the piece, hear commands, and perform his duties effectively. A convenient post is between the trail spades and on line with them.

(2) *Gunner.* Immediately behind the left wheel and outside the trail.

(3) *No. 1.* Immediately behind the right wheel and outside the trail.

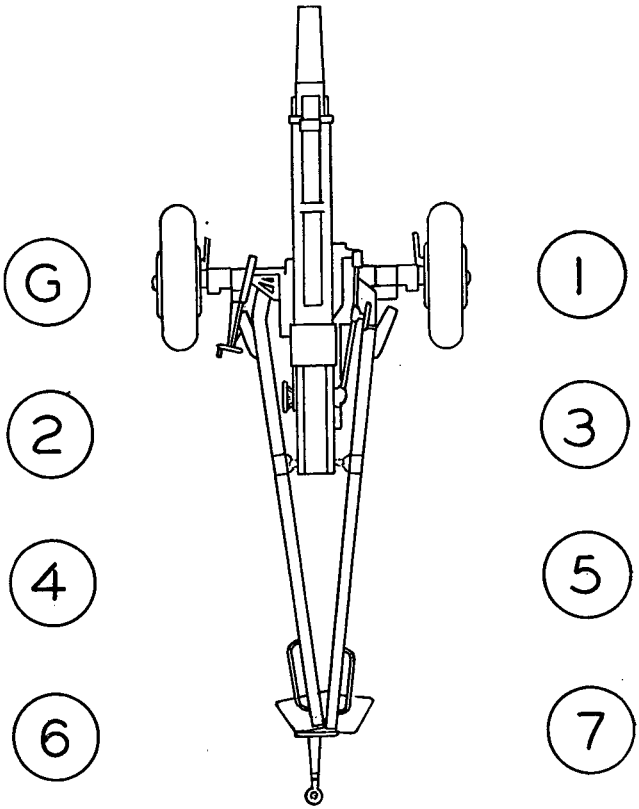

Figure 10. Posts of cannoneers, howitzer uncoupled but not prepared for action.

(4) *No. 2.* Three feet in rear of the gunner, covering him, and inside the trail.
(5) *No. 3.* Two feet to the left of No. 2.
(6) *No. 4.* Two feet in rear of No. 3, covering him.
(7) *No. 5.* Two feet to the left of No. 4.
(8) *No. 6.* Two feet to the left of No. 5.
(9) *No. 7.* Two feet in rear of No. 5, covering him.

c. At drill, all stand at attention at their posts facing the front. In firing and combat, minor modifications of these posts are required for the more efficient performance of the duties in the service of the piece and for protection of the personnel. Higher-numbered cannoneers, if present, take posts as prescribed by the chief of section.

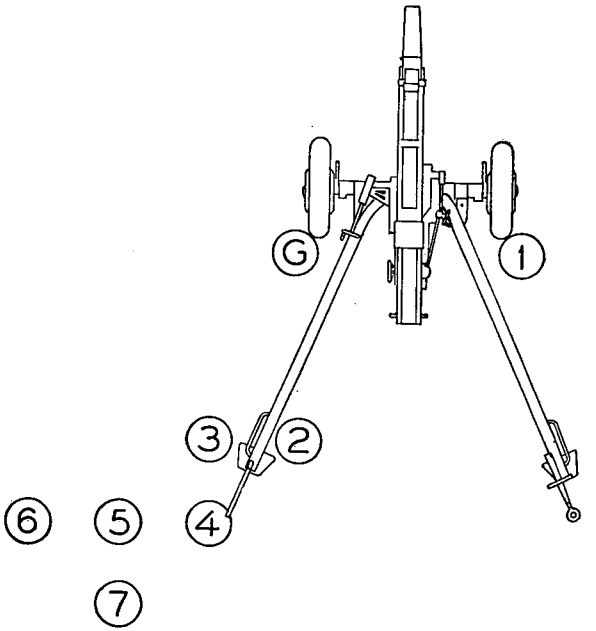

Figure 11. Posts of cannoneers, howitzer prepared for action.

d. In order to exercise the cannoneers in all the duties connected with the service of the piece and to lend variety to the drill, the posts of individual cannoneers will be rotated frequently in a manner to provide progressive instruction. In addition, the chief of section should make such individual changes as necessary during drill to assure that each cannoneer is *thoroughly* trained in the duties of two or more lower-numbered posts.

18. MARCH ORDER. **a. To resume order for marching.** The howitzer being uncoupled and prepared for action, to resume the order for marching, the command is: MARCH ORDER. Duties of individuals are as follows (on completion of his duties, each cannoneer takes his post (fig. 10)):

(1) *Chief of section.* (*a*) Supervises the work of the cannoneers.

(*b*) Inspects the matériel; makes sure that the piece is not loaded and that the trail lock and cradle lock are locked in the traveling position; and, when the operations have been completed, reports to the executive, "Sir, No. (so-and-so) in order," or reports any defects which the section cannot remedy without delay.

(2) *Gunner.* (*a*) Places the piece in the center of traverse.

(*b*) Removes left trail lock pin from the firing position and places it in the traveling position.

(*c*) Sets the rotating head and deflection at zero and closes the covers on the telescope mount level bubbles.

(*d*) Removes the telescope from the mount, returns it to its case, and locks the case.

(*e*) Replaces the breech end of the howitzer cover, assisted by No. 1.

(3) *No. 1.* (*a*) Closes the covers over the range quadrant bubbles.

(*b*) Operates elevating handwheel to assist No. 4 in locking cradle lock.

(*c*) Removes the right trail lock pin from the firing position and places it in the traveling position.

(*d*) Inspects the chamber to see that piece is unloaded and closes breech.

(*e*) Removes the elbow telescope, if mounted, from its mount and returns it to its case.

(*f*) Assists the gunner in replacing the breech end of the howitzer cover.

(4) *No. 2.* (*a*) Closes the left trail, assisted by No. 6, after No. 4 has called "Close."

(*b*) Disassembles the rammer staffs; removes the rammer (bore brush) and places it in the section chest; secures the rammer staff in its traveling position on the trail.

(5) *No. 3.* (*a*) Closes the right trail, assisted by No. 7, after No. 4 has called "Close."

(*b*) Places the fuze setter in the section chest.

(*c*) Prepares ammunition and tools, assisted by Nos. 4, 5, 6, and 7, for loading in the prime mover.

(6) *No. 4.* (*a*) Locks the cradle lock in the traveling position, assisted by the operation of the elevating handwheel by No. 1. When the cradle lock has been locked, calls "Close" to inform Nos. 2 and 3 that trails may be closed.

(*b*) Locks the left axle lock in the traveling position.

(*c*) Raises and latches the bottom shield flap, assisted by No. 5.

(*d*) Replaces the muzzle end of the howitzer cover, assisted by No. 5.

(*e*) Assists No. 3 in preparing the ammunition and tools for loading in the prime mover.

(7) *No. 5.* (*a*) Locks the right axle lock in the traveling position.

(*b*) Assists No. 4 in raising and latching the bottom shield flap.

(*c*) Assists No. 4 in replacing the muzzle end of the howitzer cover.

(*d*) Procures, disassembles, and replaces the aiming posts in covers. Secures the aiming posts in the traveling position on the trail.

(*e*) Assists No. 3 in preparing the ammunition and tools for loading in the prime mover.

(8) *No. 6.* (*a*) Assists No. 2 in closing the left trail.

(*b*) Assisted by No. 7, locks the trail lock.

(*c*) Removes the trail handspike from the left trail and secures it in its traveling position.

(*d*) Prepares the section chest for loading in the prime mover, assisted by No. 7.

(*e*) Assists No. 3 in preparing the ammunition and tools for loading in the prime mover.

(9) *No. 7.* (*a*) Assists No. 3 in closing the right trail.

(*b*) Assists No. 6 in locking the trail lock.

(*c*) Assists No. 6 in preparing the section chest for loading in the prime mover.

(*d*) Assists No. 3 in preparing the ammunition and tools for loading in the prime mover.

b. To resume fire in another position. (1) If firing is to be resumed shortly in another position to which the piece must be towed by its prime mover, the command MARCH ORDER is not given. In this case, at the command for coupling, only such of the operations incident to march order are performed as are necessary for the movement of the piece and for the care and security of the equipment.

(2) If the command MARCH ORDER is given while the piece is coupled, the operations pertaining to march order are completed.

CHAPTER 7

DUTIES IN FIRING

Section I. INDIRECT LAYING

19. GENERAL. In general, the duties in firing are as follows (see figs. 12 through 16):

a. The chief of section is responsible that all duties are properly performed, all commands executed, and all safety precautions observed.

b. The gunner sets the announced deflection, lays for direction, and refers the piece.

c. No. 1 sets the announced site and elevation, opens and closes the breech, and fires the piece.

d. No. 2 loads the piece.

e. No. 3 operates the fuze setter and makes the proper setting of fuzes.

Figure 12. Preparing ammunition.

Figure 13. Setting time fuze.

Figure 14. Squad performing duties in firing.

Figure 15. Loading the piece.

Figure 16. Piece loaded and ready to fire.

f. No. 4 assists No. 3 in setting fuzes, and passes the rounds to No. 2 for loading.

g. No. 5, assisted by Nos. 6 and 7, prepares charges and passes the assembled round to No. 4.

h. Nos. 6 and 7 remove ammunition from the containers and assist No. 5 in preparing charges and assembling rounds. No. 7 keeps empty cartridge cases out of way of the cannoneers.

20. **CHIEF OF SECTION.** **a. Enumeration of duties.** (1) To lay for elevation, assisted by No. 1, when the gunner's quadrant is used.

(2) To measure the elevation (range).

(3) To measure the site to the mask.

(4) To indicate to the gunner the aiming point.

(5) To follow fire commands.

(6) To indicate when the piece is ready to fire.

(7) To give the command to fire.

(8) To report errors and other unusual incidents of fire to the executive.

(9) To conduct prearranged fires.

(10) To record basic data.

(11) To observe and check frequently the functioning of the matériel.

(12) To assign duties when firing with reduced personnel.

(13) To check, before they are replaced in their containers, all rounds not fired which have been prepared for firing.

b. Detailed description of duties. (1) *To lay for elevation when gunner's quadrant is used.* (*a*) The command QUADRANT (SO MUCH) indicates that the gunner's quadrant is to be used.

(*b*) To set an elevation on the gunner's quadrant (fig. 17), for example, 254.5 mils, the chief of section sets the upper edge of the index plate opposite the 250 mark of the graduated arc on the quadrant frame and turns the micrometer on the index arm to a reading of 4.5. Care must be taken to face the same side of the quadrant in setting both the index plate and the micrometer knob.

(*c*) The announced elevation having been set on the gunner's quadrant, the piece loaded, and the breechblock closed, the chief of section places the quadrant on the quadrant seat, with the words "line of fire" at the bottom and the arrow pointing toward the muzzle. The chief of section must be sure to use the arrow which appears on the same side of the quadrant as the scale which he is using. He stands to the left of the breech, places his eye squarely

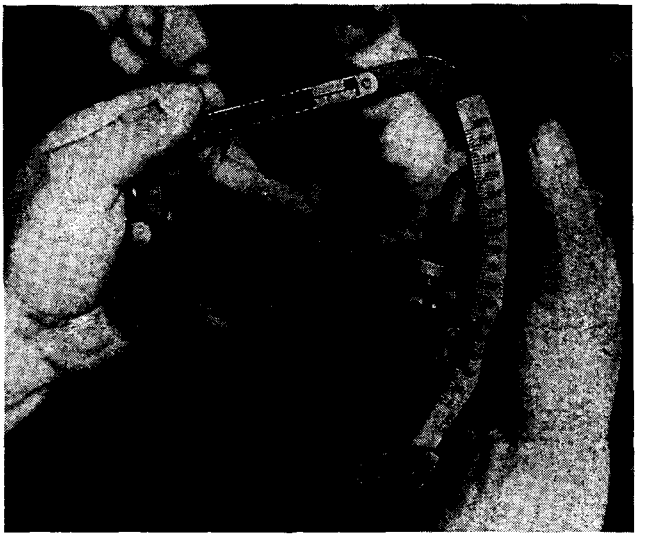

Figure 17. Setting the gunner's quadrant.

opposite the side of the quadrant, and holds the quadrant firmly on the quadrant seat, parallel to the axis of the bore. *He must hold the quadrant in the same manner* for each subsequent setting, and view the quadrant bubble from a point directly opposite to it.

(*d*) No. 1 operates the elevating handwheel until the bubble is centered, making sure that the last movement is in the direction in which it is most difficult to turn the handwheel. The chief of section warns No. 1 when the bubble

is approaching the center, in order that the final centering may be performed accurately.

(2) *To measure elevation.* At the command MEASURE THE ELEVATION, the piece having been laid, the chief of section causes No. 1 to set site 300 and, with the range drum knob, to center the range quadrant longitudinal level bubble. The chief of section then reads the elevation set on the elevation scale and announces the elevation thus set; for example, "Elevation No. (so-and-so), (so much)."

(3) *To measure site to the mask.* (*a*) The command is: MEASURE THE SITE TO THE MASK. The chief of section has No. 1 set site 300 on the angle of site scale and center the cross level bubble. Then, sighting along the lowest element of the bore, he causes No. 1 to operate the elevating mechanism until the line of sight just clears the crest at its highest point in the probable field of fire. He causes No. 1 to center the longitudinal level bubble by turning the range drum knob. He reads the desired site from the elevation scale and micrometer and reports it to the executive thus: "Site No. (so-and-so), (so much)."

(*b*) When the executive announces the minimum quadrant elevation or the minimum elevation, charge, and site, the chief of section records it in a notebook and causes No. 1 to chalk the minimum elevation for each charge to be used on a convenient place on the shield.

(4) *To indicate to gunner the aiming point.* Whenever an aiming point has been designated by the executive, the chief of section will make sure that he has properly identified the point in question. He will then indicate it to the gunner. If there is any possibility of misunderstanding, the chief of section will turn the telescope until the horizontal and vertical hairs are on the point designated.

(5) *To follow fire commands.* The chief of section will follow fire commands mentally. He will not repeat the commands but will be prepared to give any element of the last command to any cannoneer who has failed to hear it.

(6) *To indicate when piece is ready to fire.* When the executive can see arm signals of the chief of section, the chief of section will extend his right arm vertically upward as a signal that the piece is ready to fire. He gives the signal as

soon as the gunner calls "Ready." When arm signals cannot be seen, the chief of section reports orally to the executive, "No. (so-and-so) ready."

(7) *To give command to fire.* When No. 1 can see arm signals made by the chief of section, the chief of section will give the command to fire by dropping his right arm sharply to his side. When his arm signals cannot be seen, he orally commands: NO. (SO-AND-SO) FIRE. He will require the cannoneers to stand clear of the recoil of the piece.

(8) *To report errors and other unusual incidents of fire to the executive.* If the piece cannot be fired, the chief of section will promptly report that fact to the executive, and the reason; for example, "No. (so-and-so) out; misfire." Whenever it is discovered that the piece has been fired with an error in laying, the chief of section will at once report that fact with the amount of error; for example, "No. (so-and-so) fired 100 mils right." Whenever the gunner reports that the aiming posts are out of alignment with the telescope due to displacement of the piece, the chief of section, at the earliest convenience, will request permission from the executive to realign the aiming posts. Likewise, he will promptly report other unusual incidents that affect the service of the piece. (See par. 37.)

(9) *To conduct prearranged fires.* Whenever the execution of prearranged fires is ordered, the chief of section will conduct the fire of his section in strict conformity with the prescribed data.

(10) *To record basic data.* The chief of section will record in a notebook data of a semipermanent nature. These include such data as minimum elevations; base deflections, including aiming points used; prearranged fires when prepared schedules are not furnished; safety limits in elevation and deflection; number of rounds fired, with the date and hour; and calibration corrections and standing corrections when appropriate.

(11) *To observe and check functioning of matériel.* The chief of section closely observes the functioning of all parts of the matériel during firing. Before the piece is fired, he makes sure that the recoil mechanism contains the proper amount of oil; thereafter he carefully observes the function-

ing of the recoil system. He promptly reports to the executive any evidence of trouble.

(12) *To assign duties when firing with reduced personnel.* Whenever the personnel of the section serving the piece is temporarily reduced in numbers below that indicated in this manual, the chief of section will make such redistribution of duties as will best facilitate the service of the piece.

(13) *To check, before replaced in their containers, all rounds not fired which have been prepared for firing.* The chief of section personally checks, before they are replaced in their containers, all rounds not fired which have been prepared for firing, to see that all seven increments are present in proper condition, that they are assembled in the proper numerical order, and that they are of the proper lot number. He also checks to see that the lot number on the ammunition corresponds to the lot number on the container. He obtains a slip of paper on which an officer of the battery has certified with his initials that all required precautions as to checking increments have been taken, and gives it to No. 6 for inclusion under the seal when unused ammunition is replaced in containers and sealed.

21. **GUNNER. a. Enumeration of duties.** (1) To center the bubbles on the telescope mount.

(2) To set or change the deflection.

(3) To apply the deflection difference.

(4) To lay for direction.

(5) To call "Ready."

(6) To refer the piece.

(7) To record base deflection.

(8) To measure a deflection.

(9) To make corrections for aiming post displacement.

b. Detailed description of certain duties. (1) *To set or change deflection.* (*a*) *To set deflection.* At the command, for example, DEFLECTION 483, the gunner first sets the azimuth micrometer index (movable) to its zero position and zeros the azimuth micrometer if it is not already so set. Using his left hand, he pushes the throw-out lever, and with his right hand turns the rotating head until the numeral 4 on the azimuth scale appears opposite the azimuth scale index.

He then grasps the azimuth worm knob with his right thumb and forefinger and turns the knob clockwise until the numeral 83 on the azimuth micrometer appears opposite the azimuth micrometer index (movable). The gunner now turns the azimuth micrometer index (movable) opposite an even ten graduation on the micrometer in preparation for setting off the next shift. This last movement does not change the setting of the azimuth scales.

(*b*) *To change deflection.* The gunner should be trained to grasp the azimuth worm knob with his right thumb and forefinger. He also should be taught that moving his thumb upward (clockwise) will cause the deflection to increase, and the tube must be traversed to the left to bring the line of sight back on the aiming point or aiming posts. Similarly, he should be taught that moving his thumb downward (counterclockwise) causes the deflection to decrease and results in a right shift in the tube when the weapon is relaid. The deflection having been set at 483 mils, if a subsequent shift of RIGHT 55 is commanded, the gunner moves his right thumb downward (counterclockwise) on the azimuth worm knob until the deflection is decreased 55 mils. If the gunner had set the azimuth micrometer index (movable) opposite 80 on the micrometer before the deflection change was given, the numeral 25 would appear opposite the azimuth micrometer index (movable) after the change. However, the true reading on the azimuth scale is obtained by turning the movable index back to its zero position and noting the reading on the scales, in this case (483 mils −55 mils) 428 mils. The azimuth micrometer index (movable) permits the gunner to start from an even ten graduation each time a shift is given. The gunner, having set off RIGHT 55, would move the azimuth micrometer index (movable) opposite 20 or 30 on the micrometer in preparation for the next shift. Should the command be LEFT (SO MUCH), the gunner changes the setting by moving his thumb upward (clockwise) on the azimuth worm knob, thus increasing the deflection.

(2) *To apply deflection difference.* (*a*) The command is: ON NO. (SO-AND-SO) OPEN (CLOSE) (SO MUCH). The gunner of the piece indicated in the command does not change the deflection set on his telescope. Each of the other

gunners changes his deflection setting by the number of mils specified in the command if his piece is next in line to the piece indicated; by twice this number of mils if his piece is second in line from the piece indicated; by three times this number of mils if his piece is third in line from the piece indicated.

(*b*) If the command is, for example, ON NO. 2 OPEN 5, the gunner on No. 2 makes no change; the gunner on No. 1 turns the azimuth worm knob by moving his right thumb downward (counterclockwise) to decrease his setting 5 mils; the gunner on No. 3 moves his thumb upward (clockwise) to increase his setting 5 mils; and the gunner on No. 4 moves his thumb upward until the deflection is increased 10 mils (twice the number of mils specified in the command).

(*c*) Should the command be, for example, ON NO. 3 CLOSE 10, the gunner on No. 3 does not change his setting; the gunner on No. 1 moves his right thumb upward until his deflection setting has been increased 20 mils; the gunner on No. 2 moves his thumb upward until 10 mils have been added to the deflection; and the gunner on No. 4 moves his thumb downward until the setting has decreased 10 mils.

(*d*) When a deflection change and a deflection difference are announced at the same time (for example, RIGHT 30, ON NO. 1 CLOSE 5), both of which affect the gunner's piece, he should first set off the deflection change and then apply the deflection difference.

(*e*) In the methods described above, it is implied that the gunner resets the azimuth micrometer index (movable) opposite an even ten graduation each time the azimuth worm knob has been turned. This facilitates setting off the tens and units on the azimuth micrometer scales. The gunner, before turning the azimuth worm knob, should verify that the movable index coincides exactly with the even ten graduation he has chosen.

(3) *To lay for direction.* (*a*) The deflection having been set, the gunner brings the vertical hair of the panoramic telescope on the aiming point by traversing the piece. If the amount of movement necessary is greater than can be obtained by traversing, the trails must be shifted. To have the trails shifted, the gunner commands or signals: MUZ-

ZLE RIGHT (LEFT). Nos. 2 and 6 on the left trail handspike and Nos. 3 and 7 on the drawbar on the right trail then shift the trails so that the muzzle moves in the indicated direction. They stop shifting when commanded or signaled to stop by the gunner. The gunner completes the laying by centering the cross-level bubble on the telescope mount and by traversing the piece until the vertical hair in the telescope is on the aiming point while the cross level bubble is exactly centered.

(*b*) To take up lost motion and improve the accuracy of laying, the final movement of the traversing handwheel should be such as to cause the vertical hair of the telescope to approach the aiming point from the left. The gunner should habitually lay with the vertical hair of the telescope on exactly the same portion of the aiming point or target and should insure that at the same time the cross level bubble is centered.

(4) *To Call "Ready."* The piece having been laid for direction and No. 1 having called "Set," the gunner verifies the laying, moves his head clear of the telescope, and calls "Ready" to indicate that the piece is ready to be fired.

(5) *To refer the piece.* The piece having been laid for direction, to refer the piece, the command is: AIMING POINT (SO-AND-SO), REFER. Without disturbing the laying of the piece, the gunner brings the vertical hair of the telescope on the new aiming point (referring point), keeping the cross level bubble centered. He then reads and announces the deflection thus set. The piece may be laid subsequently using this referring point as an aiming point. This method affords a convenient means of laying when the initial aiming point is either not convenient or not permanent. The piece is normally referred to the aiming posts, but should also be referred to one or more distant referring points for accuracy and permanence. The chief of section records the deflection and a description of each referring point in his notebook. The gunner records the deflection and aiming point in current use on a convenient part of the shield.

(6) *To record base deflection.* At the command RECORD BASE DEFLECTION, the gunner records the deflection set on his

telescope upon some convenient part of the shield or upon a data board (par. 44).

(7) *To measure a deflection.* The command is: AIMING POINT (SO-AND-SO), MEASURE DEFLECTION. The piece having been established in direction, the gunner turns the telescope until the vertical hair is on the aiming point. He then reads and announces the deflection.

(8) *To make corrections for aiming post displacement.* See paragraph 36.

22. NO. 1. a. Enumeration of duties. (1) To set the angle of site.

(2) To set the range.

(3) To set the elevation.

(4) To lay for elevation.

(5) To open and close the breech.

(6) To call "Set."

(7) To fire the piece.

(8) To use the rammer.

b. Detailed description of duties. (1) *To set angle of site.* (*a*) When an angle of site is to be used, the initial series of fire commands for opening fire will contain the command for site. The command is, for example: SITE 305. For subsequent rounds, the site setting is increased (decreased) at the command UP (DOWN) (SO MUCH).

(*b*) No. 1 is first taught to read angles of site on the site scale and then to set angles of site. To set an angle of site, No. 1 turns the angle of site worm knob until the announced site is shown. The angle of site is indicated by a scale graduated in hundreds of mils from 0 to 6 and a micrometer scale graduated in mils. A site of 300 is horizontal. No. 1 first sets the index in the proper section of the scale in hundreds of mils and then sets the units on the micrometer scale. The last motion in setting the angle of site should be in the direction of increasing site.

(2) *To set elevation.* No. 1 is first taught to read elevations on the elevation scale and then to set elevations. To set an elevation, No. 1 sets the angle of site at 300 (or at an announced site) and sets the announced elevation on the elevation scale. The elevation is indicated by a scale

graduated in hundreds of mils from minus 100 to plus 1200 and a micrometer scale graduated from zero to 100 mils. No. 1 grasps the elevating knob and turns it until the announced elevation is shown, making sure that the last movement is in the direction of increasing elevation.

(3) *To lay for elevation.* No. 1 turns the cross leveling worm knob and centers the cross level bubble. Having performed the duties described in (1), (2), and (3) above, he turns the elevating handwheel and elevates or depresses the tube until the longitudinal bubble is centered making sure that his eye is directly opposite the bubble and that the last movement is in the direction in which it is most difficult to turn the handwheel.

(4) *To open and close the breech.* (*a*) *To open breech.* No. 1 grasps the breech operating lever handle with his left hand, pushes down on the handle to release the catch, and draws it toward him and to the rear, opening the breech.

(*b*) *To close the breech.* No. 1 grasps the operating handle with his left hand and pushes it forward and away from him until the breech is closed and the latch is engaged.

(5) *To call "Set."* No. 1 calls "Set" when the piece has been loaded, the breech closed, and the piece laid for site and elevation.

(6) *To fire the piece.* At the command of the chief of section, NO. (SO-AND-SO) FIRE, No. 1 grasps the handle of the lanyard and fires the piece. If the chief of section commands WITH THE LONG LANYARD, No. 1 attaches the long lanyard to the short lanyard and fires as previously described. In case of a misfire, the instructions contained in paragraph 42 will be followed.

(7) *To use the rammer.* Normally the rammer (bore brush) will be handled by No. 1. The rammer and rammer staff are used to extract unfired rounds or cartridge cases which cannot be ejected by the extractor. To extract a cartridge case, No. 1 removes the rammer (bore brush) from the rammer staff, inserts the rammer staff in the bore, and lightly taps the bottom of the inside of the case until it is loosened and can be pushed out of the chamber. No. 2, standing at the breech, receives the cartridge case in both

hands. To extract an unfired round, the procedure described in paragraph 41 will be followed.

23. NO. 2. a. Enumeration of duties. (1) To load the piece.

(2) In volley fire, to call out the number of the round.

(3) When necessary, to assist No. 6 in shifting the left trail.

(4) To inspect the chamber and bore when the breech is opened in order to insure that they are clear.

b. Detailed description of duties. (1) *To load the piece.* To receive the round, No. 2 steps with his left foot toward No. 4 and grasps the round with his right hand at the base of the cartridge case and his left hand in front of the rotating band. After resuming his position facing the gunner, he inserts the round in the breech and pushes it home with his right hand. He must use care, especially at higher elevations, to avoid injuring his hand. When necessary to insert his hand into the breech recess to push the round home, he should first close his fist. No. 2 will be particularly careful to avoid striking the fuze against any portion of the piece. A round to be loaded will be held well out of the path of the recoil until the piece is again in battery (AR 750–10).

(2) *To call out number of round.* To insure that the correct number of rounds is fired in volley fire, No. 2 calls out the range and the number of the round as he loads the piece and, as he loads the last round, adds "last round." For example, when two rounds are to be fired at 2800, he calls out, "2800 two, last round." He should not speak more loudly than is necessary to insure his being heard by the members of his own howitzer squad.

(3) *When necessary, to assist No. 6 in shifting left trail.* No. 2 assists No. 6 in shifting the left trail as directed by the gunner. The command is: MUZZLE RIGHT (LEFT), and the trail is shifted in the opposite direction so that the muzzle is swung in the direction indicated. At the gunner's command or signal to stop shifting, Nos. 2 and 6 lower the trail to the ground.

(4) *To inspect the chamber and bore when the breech is open to insure that they are clear.* No. 2 will inspect the

chamber and bore after each round is fired to make certain the chamber is clear and the bore is free of any residue from charge.

24. NO. 3. **a. Enumeration of duties.** (1) To make the prescribed setting of impact fuzes.

(2) To set the fuze setter.

(3) To set time fuzes.

(4) When necessary, to assist No. 7 in shifting the right trail.

b. Detailed description of duties. (1) *To make prescribed setting of impact fuzes.* (*a*) The fire commands for opening fire will contain a designation of the setting desired when the prescribed fuze can be given more than one setting.

(*b*) If the command is FUZE QUICK, No. 3 will verify the setting and reset to *quick* any fuzes which may be set *delay.*

(*c*) After firing is completed, No. 3 will reset to *quick* any fuzes which have been set *delay.*

(2) *To set fuze setter.* (*a*) The initial series of fire commands for opening fire with time-fuzed projectiles will contain the data to be set on the fuze setter. These commands are, for example: CORRECTOR 28, TIME 18.0. The corrector may be changed by announcing a new corrector, for example, "Corrector 33;" the time may be changed by announcing a new time, for example, "Time 22.4."

(*b*) No. 3 sets off on the fuze setter the announced time, and corrector if used. If a corrector is not used, the fuze setter corrector setting should be 30.

(3) When the fuze setter is used in setting time fuzes, No. 3 sets off the desired setting on the fuze setter and places it over the fuze. He then presses down firmly on the fuze setter and rotates it in a clockwise direction until the lugs on the fuze setter engage with the slots on the fuze. He continues to rotate the fuze setter in a clockwise direction until it can be turned no further. This produces the same setting on the fuze as was set on the fuze setter. When the hand fuze setter wrench is used, care should be taken to always set the fuze in the same direction. If the desired time setting is passed, the time ring on the fuze should be turned back several seconds and then continued in the origi-

nal direction until the desired time is again opposite the index.

(4) *When necessary, to assist No. 7 in shifting right trail.* No. 3 assists No. 7 in shifting the right trail as directed by the gunner. The command is: MUZZLE RIGHT (LEFT), and the trail is shifted in the opposite direction so that the muzzle is swung in the direction indicated. At the gunner's command or signal to stop shifting, Nos. 3 and 7 lower the trail to the ground.

25. NO. 4. a. Enumeration of duties. (1) To assist No. 3 in setting time fuzes.

(2) To pass the round to No. 2.

b. Detailed description of duties. (1) *To assist No. 3 in setting time fuzes.* See paragraph 24b (3).

(2) *To pass the round to No. 2.* No. 4, with his left hand under the cartridge case, his right hand under the projectile, taking care that the projectile and cartridge case do not separate, so passes the round to No. 2 that No. 2 is able to grasp the base of the cartridge case in his right hand.

26. NO. 5. a. Enumeration of duties. (1) To set out aiming posts.

(2) To prepare charges.

(3) To pass the round to No. 4.

(4) To replace increments in the cartridge case before rounds are replaced in their containers.

b. Detailed description of duties. (1) *To set out aiming posts.* When so directed by the chief of section, No. 5 sets out the aiming posts under the guidance of the gunner (see par. 35).

(2) *To prepare charges.* The fire commands for opening fire will include the designation of the charge. No. 5 verifies the number of increments and removes those increments numbered higher than the charge designated. He then replaces the remaining increments in the cartridge case in their original numerical order. After No. 5 has prepared the charge, No. 6, assisted by No. 7, assembles the projectile to the cartridge case. Care must be used to prevent damage to the lip of the cartridge case.

(3) *To pass the round to No. 4.* No. 5 will pass the round to No. 4 in the most convenient manner.

(4) *To replace increments in cartridge case before rounds are replaced in their containers.* Under the personal supervision of the chief of section, No. 5, assisted by Nos. 6 and 7, replaces increments in cartridge cases for all ammunition prepared for firing but not fired. He carefully checks to see that all seven increments are present, in the proper condition, assembled in the proper numerical order, and that they are of the proper lot number.

27. **NO. 6. a. Enumeration of duties.** (1) To remove ammunition from containers.

(2) To assist No. 5 in preparing charges.

(3) When necessary, assisted by No. 2, to shift the left trail.

(4) To replace unused ammunition in containers.

b. Detailed description of duties. (1) *To remove ammunition from containers.* Assisted by No. 7, No. 6 removes rounds from their containers and arranges them so that they are within easy reach of No. 5. He inspects each round to see that it is free from sand and dirt and that the rotating band is not burred. With an oily cloth, he wipes off any foreign matter. Projectiles with burred rotating bands should be placed aside until he can remove the burs with a file.

(2) *To assist No. 5 in preparing charges.* When so directed, Nos. 6 and 7 assist No. 5 in preparing charges as described in paragraph 26b (2).

(3) *When necessary, assisted by No. 2, to shift left trail.* When so directed by the gunner, No. 6, assisted by No. 2, shifts the left trail (see par. 23b (3)).

(4) *To replace unused ammunition in containers.* Under the personal supervision of the chief of section and assisted by No. 7, No. 6 replaces unused ammunition in containers, being careful that the lot number on the ammunition corresponds to the lot number on the container. When sealing the container, he includes, in a visible position under the seal, the slip of paper (officer's certificate) obtained from the chief of section.

28. NO. 7. a. **Enumeration of duties.** (1) To assist No. 6 in removing ammunition from containers.

(2) To assist No. 5 in preparing charges.

(3) To keep empty cartridge cases out of the way of the cannoneers.

(4) When necessary, assisted by No. 3, to shift the right trail.

(5) To assist No. 6 in replacing ammunition in containers.

b. **Detailed description of duties.** (1) *To assist No. 6 in removing ammunition from containers.* No. 7 assists No. 6 in removing rounds from their containers as described in paragraph 27b (1).

(2) *To assist No. 5 in preparing charges.* Nos. 7 and 6 assist No. 5 in preparing charges as described in paragraph 26b (2).

(3) *To keep empty cartridge cases out of way of cannoneers.* No. 7 piles the empty cartridge cases in rear of the right trail where they will be out of the way of the cannoneers.

(4) *When necessary, assisted by No. 3, to shift right trail.* When so directed by the gunner, No. 7, assisted by No. 3, shifts the right trail (see par. 24b (4)).

(5) *To assist No. 6 in replacing ammunition in containers.* No. 7 assists No. 6 in replacing rounds in containers in a manner similar to that described in paragraph 27b (4).

Section II. DIRECT LAYING

29. **GENERAL.** Delivery of fire by direct laying demands a high degree of training in its special technique, since it requires the section to operate as an independent unit. This training is based on the technique employed in the normal mission of indirect laying. The high standards of speed and accuracy required in direct laying are even more important when the target may be returning the fire. There are two basic systems of sight control: the two-man, two-sight system (par. 31); and the one-man, one-sight system (par. 32). When ordered by the executive to conduct the fire of his piece, the chief of section will designate the system to be used. Training should include both systems. For information on training, see FM 6–140.

30. **PREPARATORY STEPS. a. Prepare range card.** At the earliest possible time, a range card should be prepared indicating the ranges and corresponding elevations to critical points in likely avenues of enemy tank or vehicle approach. Where no prominent terrain features are available, stakes may be driven in the ground for range reference points. Corresponding elevations for charge 6 and the angle of site to key points in the sector may be noted on the range card (for use with the one-man, one-sight system). In preparing the range card, the range line in the reticle

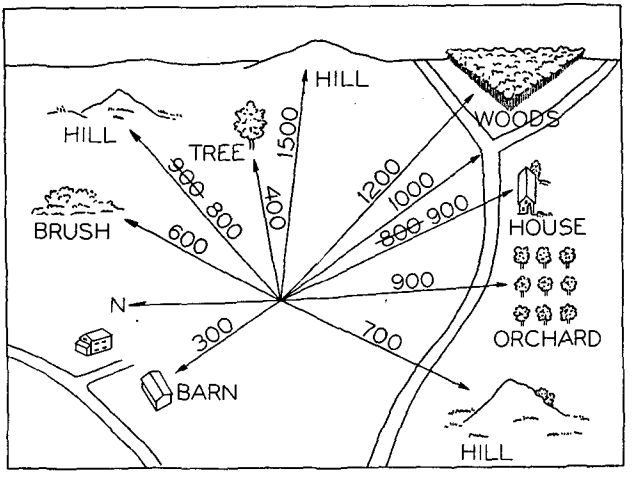

Figure 18. Range card.

which will be used for different charges and different projectiles in firing at various targets should be included in addition to the ground range. As time permits, the range card will be improved by noting thereon ranges obtained by firing, pacing, taping, from vehicular odometer readings, and from measurements made from a map or survey. (See fig. 18.)

b. Clear area. The sector of fire for the piece must be cleared of all obstructions which will endanger battery personnel when the piece is fired.

31. **TWO-MAN, TWO-SIGHT SYSTEM. a. Chief of section.** (1) *Enumeration of duties.* (*a*) To prepare a range card.

(*b*) To conduct the fire of his piece on order of executive.

(*c*) To provide for the clearance of all immediate obstructions within his sector which will endanger battery personnel when the piece is fired.

(*d*) To select or identify the target.

(*e*) To determine the lead and range.

(*f*) To announce initial commands.

(*g*) To announce subsequent commands, based on the observed effect.

(2) *Detailed description of certain duties.* (*a*) *To prepare a range card.* See paragraph 30a.

(*b*) *To identify the target.* The battery executive will give the preliminary command: TARGET (SO-AND-SO), FIRE AT WILL. The chief of section upon receiving this command, must correctly identify the target to his section.

(*c*) *To determine initial lead.* The chief of section observes the target, estimates its lateral speed, and (based on the speed) estimates the lead in mils. The appropriate leads in mils for targets moving at typical tank speeds when shell HE-AT or shell HE with charge 6 is fired are as follows:

Lateral speed	*Lead*
Slow (0 to 5 m. p. h.)	5 mils
Medium (5 to 10 m. p. h.)	10 mils
Fast (10 to 15 m. p. h.)	15 mils

(*d*) *To determine initial range.* The chief of section estimates the initial range to the target and determines the appropriate range line on the reticle of the elbow telescope. The reticle pattern for shell HE-AT M67 is also used for charge 6. For other charge or reticle pattern the aiming data chart issued with the elbow telescope is used to determine the appropriate range line. A range card with accurately determined ranges to key points provides the best means for estimating the initial range.

(*e*) *To announce initial commands.* The chief of section will announce fire commands containing the following elements in sequence:

1. *Designation of target.* The command is: TARGET (SO-AND-SO).
2. *Projectile, charge, and fuze.* The commands specify the appropriate items in sequence, such as SHELL HE, CHARGE 6, FUZE DELAY; OR SHELL ANTITANK. Shell HE-AT will be used against tanks except where bracketing methods of adjustment are employed. When shell HE-AT is not available or when bracketing methods are employed, shell HE is used. With shell HE-AT, no command for charge or fuze is necessary. When firing shell HE against close-in targets, use charge 6 since the trajectory with this charge approximates that for HE-AT. Against distance targets or stationary targets where bracketing methods are used, charge 7 may be fired. Fuze delay should be used against tanks, armored vehicles, fortifications, or personnel. If less than 50 percent of the rounds fired against personnel during adjustment are ricochet bursts, the fuze setting should be changed to superquick. Concrete piercing fuze with HE shell should be used, whenever available, against concrete pillboxes or fortifications.
3. *Lead.* The command is: LEAD (SO MUCH).
4. *Method of fire.* Usually the command is: CONTINUOUS FIRE, the piece being loaded and laid as rapidly as possible and fired at the command of the gunner.
5. *Range.* The command is: RANGE (SO MUCH).

Note. Commands in 2 and 4 above may be omitted when the state of training of the howitzer squad or standing operating procedure permit.

(*f*) *To determine subsequent data.* See paragraph 33.

(*g*) *To announce a change in lead and range.* During adjustment, changes in lead to be applied to the lead being used are commanded as RIGHT (LEFT) (SO MUCH). Range is increased by the command ADD (SO MUCH) and decreased by the command DROP (SO MUCH).

b. Gunner. (1) *Enumeration of duties.* (*a*) To center the cross level bubble on the panoramic telescope mount.

(*b*) To set the elevation index and micrometer of the panoramic telescope at zero.

(*c*) To set the azimuth scale and micrometer of the panoramic telescope at zero.

(*d*) To track the target.

(*e*) To command FIRE.

(*f*) To re-lay on the target immediately after the piece has fired.

(*g*) To repeat his actions in accordance with the fire commands and subsequent changes thereto.

(2) *Detailed description of certain duties.* (*a*) *To lay on the target with announced lead and track the target.* The gunner sets his azimuth scales at zero and tracks the target with the traversing handwheel, using the center of the visible mass as an aiming point and keeping the vertical hair of the telescope ahead of the target by measuring the announced lead on the reticle scale (fig. 19). When time does not permit the chief of section to announce the lead, it is determined by the gunner.

(*b*) *To give command to fire.* He gives the command FIRE, when ready, after No. 1 has called "Set."

c. No. 1. (1) *Enumeration of duties.* (*a*) To lay for range, using the elbow telescope.

(*b*) To track the target.

(*c*) To call "Set" when the piece is loaded and the correct range line is on the center of the visible mass of the target.

(*d*) To re-lay on the target immediately after the piece has fired.

(*e*) To repeat his actions in accordance with the fire commands and subsequent changes thereto.

(2) *Detailed description of certain duties. To lay for range, using elbow telescope.* In direct laying, when so directed, No. 1 lays for range (with the correct angle of site automatically applied) by using the appropriate range line in the reticle of the elbow telescope. No. 1, using the elevating handwheel, keeps the range line corresponding to the announced range on the center of the visible mass of the target (fig. 20).

d. No. 5. (1) *Enumeration of duties.* (*a*) To open and close the breech.

(*b*) To indicate that the piece is loaded by tapping No. 1 on the shoulder.

(*c*) To fire the piece at the gunner's command.

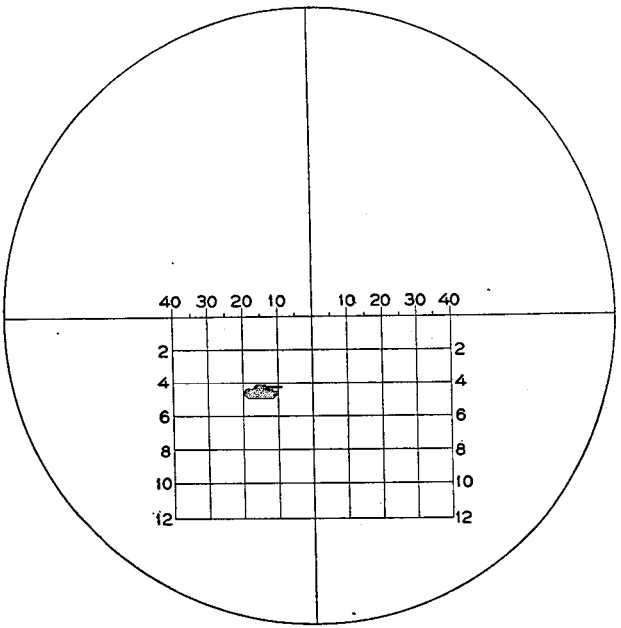

Figure 19. Gunner's sight picture, two-man, two-sight system (lead 15 mils).

(2) *Detailed description of certain duties. To open and close breech and fire piece.* No. 5 will take position in rear of No. 1 and will open and close the breech and fire the piece (par. 22).

e. Remainder of squad. All duties are the same and are performed in the same manner as in indirect laying.

32. **ONE-MAN, ONE-SIGHT SYSTEM. a. Chief of section.** The duties of the chief of section are the same as in the two-man, two-sight system (par. 31a).

b. Gunner. (1) *Enumeration of duties.* (*a*) To lay on the target with the announced lead and range measured on the scales of the panoramic telescope reticle.

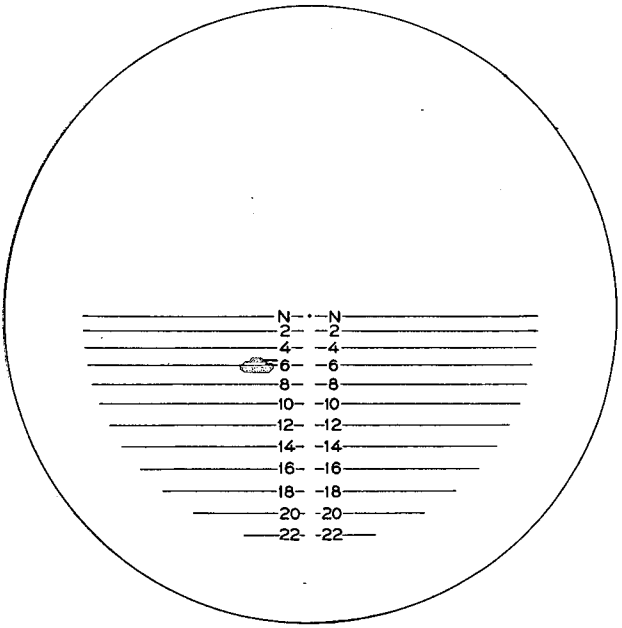

Figure 20. No. 1's sight picture, two-man, two-sight system (range 600 yards).

(*b*) To command FIRE when the piece is laid.

(*c*) To re-lay on the target immediately after the piece has been fired.

(*d*) To repeat his actions in accordance with the fire commands and subsequent changes thereto.

(2) *Detailed description of certain duties.* (*a*) *To lay for both direction and range.* The gunner matches the indexes on the telescope mount and sets the elevation indexes and azimuth scales of the panoramic telescope at zero. After laying approximately on the target, he centers the telescope mount cross level bubble. He then lays on the target with

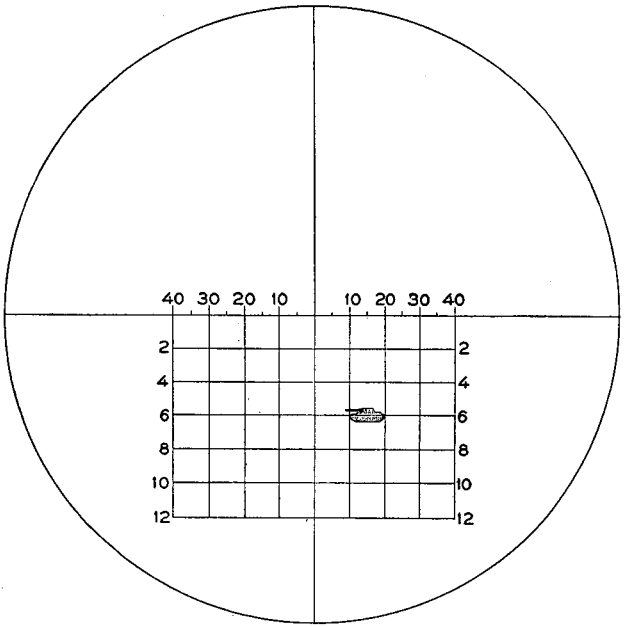

Figure 21. Gunner's sight picture, one-man, one-sight system (lead 15 mils; range 600 yards).

the announced lead and range measured on the scales of the reticle (fig. 21).

(*b*) *Other duties.* Performed as in the two-man, two-sight system (par. 31b).

c. No. 1. (1) *Enumeration of duties.* (*a*) To level longitudinal and cross level bubbles initially.

(*b*) To open and close the breech.

(*c*) To call "Set" when the piece is loaded.

(*d*) To fire the piece at the gunner's command FIRE.

(2) *Detailed description of certain duties.* No. 1 opens and closes the breech and fires the piece as described in paragraph 22.

d. Remainder of squad. All duties are the same and are performed in the same manner as in indirect laying.

33. CONDUCT OF FIRE. a. Trajectory characteristics. When HE shell with charge 6 or shell HE-AT is fired, the following trajectory characteristics will govern the manner of conducting fire:

(1) *Ranges from 0 to 400 yards.* Within these range limits, the trajectory will be too flat to permit an 8-foot tank to pass under it. The upper range of 400 yards is the ideal at which to open fire on an approaching tank, since rapid fire can then be conducted without misses if deflection is correct.

(2) *Ranges from 400 to 700 yards.* These range limits include the zone in which the trajectory is sufficiently flat to permit direct estimation of errors without actual bracketing of the target. Assuming zero vertical dispersion, if a hit is obtained at the bottom of an 8-foot tank at the upper limit (700 yards), a 100-yard range change (to 800 yards) will result in a round which will just brush the top of the tank. During adjustment within this zone, range changes should seldom be more than 100 yards, and frequently range changes of 50 yards will be sufficient. The upper limit is the greatest range at which fire should be opened unless tactical conditions require otherwise. The second shot (or certainly the third) should be a hit.

(3) *Ranges from 700 to 1,300 yards.* The range limits from 700 to 1,300 yards include a zone in which hits are reasonably possible. Ordinarily, bracket methods are used to obtain an adjustment for range in this zone. Fire should not be opened at these ranges unless surprise is of no consideration. Dispersion is a considerable factor in firing at targets within this zone.

(4) *Ranges over 1,300 yards.* At ranges above 1,300 yards, direct laying is not advisable against moving targets.

However, it would be pointless to withhold fire until the target came within a range of 1,300 yards if the gun position had been disclosed. Dispersion is the controlling factor. Ranges must be known accurately or determined by bracketing.

b. Vertical displacement. The vertical displacement for each 100-yard range change, with the 105-mm howitzer M2 or M2A1, firing charge 6, is shown in the following table:

Range	Vertical displacement	Range	Vertical displacement
Yards	*Feet*	*Yards*	*Feet*
100	1	800	8.5
200	2	900	9.5
300	3	1,000	11.5
400*	4	1,100	12.5
500	5	1,200	13.5
600	6	1,300*	15
700*	7		

*Critical direct-laying ranges.

CHAPTER 8

ADDITIONAL INFORMATION ON SERVICE OF THE PIECE

34. **ACCURACY IN LAYING.** Sighting and laying instruments, fuze setters, and elevating and traversing mechanisms will be so manipulated as to minimize the effects of lost motion. This requires that all bubbles be accurately centered and that last motions in setting instruments and in laying always be in the directions prescribed. The gunner and any other cannoneers who have duties in connection with laying the piece will invariably verify the laying after the breech has been closed.

35. **AIMING POSTS.** a. When a suitable natural aiming point is not visible, the piece, after it has been laid initially for direction, is referred to the aiming posts as described in paragraph 21b (5). Two aiming posts are used for each piece. Each post is equipped with a light for use in firing at night. One post is set up in a convenient location at least 100 yards from the piece. The other post is set up at the midpoint between the first post and the piece, and is lined in by the gunner so that the vertical hair of his telescope and the two aiming posts are all in line. Distances should be determined by pacing or other method to insure that the far post is set at twice the distance to the near post. Any lateral displacement of the piece during firing can then be detected easily and corrected as indicated in paragraph 36. For night use, the lights should be adjusted so that the far one will appear several feet higher than the near one; thus the two lights will clearly establish a vertical line on which the vertical hair of the telescope can be laid.

b. The panoramic telescope is mounted a considerable distance away from the center of rotation of the top carriage. As a result, large changes in deflection will cause misalignment of the aiming posts because of movement of the sight on an arc around the center of the top carriage. Placing the aim-

ing posts between 600 and 700 mils to the left front (deflection 2600 to 2500 when the howitzer is in center of traverse) will minimize the effects of this condition.

36. CORRECTION FOR DISPLACEMENT. When the gunner notes that the vertical hair of the telescope is displaced from the line formed by the two aiming posts (or aiming post lights), he lays in such a manner that the far aiming post (light) appears exactly midway between the near aiming post (light) and the vertical hair (fig. 22). If the displacement is due to traverse of the piece, the gunner continues to lay as described above. However, if the dis-

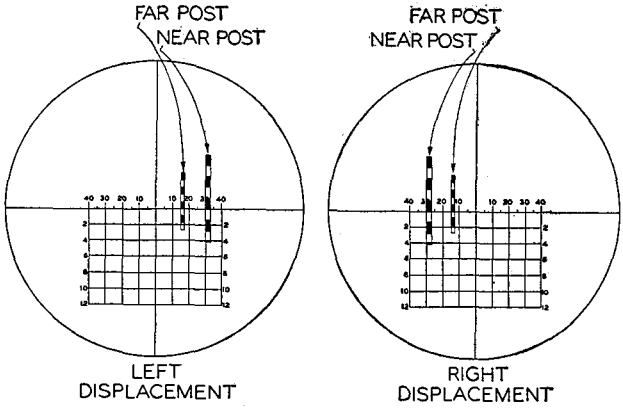

Figure 22. Displacement of aiming posts.

placement is due to progressive shift in position of the carriage from shock of firing or other cause, the gunner will notify the chief of section, who, at the first lull in firing, will notify the executive and request permission to realign aiming posts. To perform the alignment, the piece is laid with the sight picture described above. The far aiming post is moved into alignment with the vertical hair of the telescope, and then the near aiming post is aligned. If, due to terrain conditions, it is impracticable to move one of the

two aiming posts, the piece is laid for direction and referred to the aiming post which cannot be moved. The other post is aligned and new deflection setting reported to the executive.

37. REPORTING ERRORS. All members of the howitzer squad are trained to report to the chief of section errors in setting or laying discovered after the command FIRE has been given. The chief of section will immediately report errors to the executive, as prescribed in paragraph 20b (8).

38. CEASE FIRING. The command CEASE FIRING normally is given to the howitzer squad by the chief of section, but in emergencies anyone present may give the command. At this command, regardless of its source, firing will cease immediately. If the piece is loaded, the chief of section will report that fact to the executive. Firing is resumed at the executive's announcement of the range or elevation.

39. SUSPEND FIRING. The command SUSPEND FIRING is given only when the battery is firing on a prearranged schedule and a temporary halt in the firing is desired. At this command, firing is stopped but settings continue to be altered in conformity with the schedule. If the piece is loaded, the chief of section will report that fact to the executive. Firing will be resumed at the executive's command RESUME FIRING.

40. CHANGE IN DATA DURING FIRING. The announcement to the howitzer squad of any new element of firing data is a command to stop all firing previously ordered but not yet executed. If the piece is not loaded when a new element of firing data is announced, the new data will be set off and firing resumed at the announcement of the elevation. If the piece is loaded and the new data require a change in the fuze setting, the chief of section will suspend firing and report to the executive that the piece is loaded. The piece will be unloaded (par. 41) or firing will be resumed only on orders of the executive. (If no change in the fuze setting is required, the new data are set off and the firing is resumed.)

41. **TO UNLOAD PIECE.** a. When the command UNLOAD is given, No. 1 opens the breech slowly. No. 2, standing at the breech, receives the ejected round or cartridge case.

b. Should the extractor fail to eject the complete round, the assembled staff and rammer (or staff and unloading device, if available) is used. An officer sees that the recess in the head of the rammer or device is free from obstructions. Under the direct supervision of an officer, No. 1 inserts the rammer or device in the bore until the head incloses the fuze and comes in contact with the projectile. He pushes and, if necessary, taps the rammer staff lightly until the round is dislodged from its seat. He then pushes it out of the breech; No. 2 receives it.

c. If the extractor has ejected the cartridge case but not the projectile, No. 1 fills the chamber with waste and closes the breechblock. He dislodges the projectile as prescribed in b above. No. 2 then opens the breech, removes the waste, and receives the projectile as No. 1 pushes it to the rear.

d. When practicable, the procedure prescribed in TM 9–1900 should be followed.

42. **MISFIRES.** In the event of a misfire, at least two attempts to fire the primer will be made before the executive will command UNLOAD. The procedure is the same as in paragraph 41. If the extractor ejects the round, the round will be disposed of as prescribed in TM 9–1900. If the extractor ejects only the cartridge case (as frequently happens), the case will be immediately thrown clear of all personnel to prevent injury in case of a hangfire. Another cartridge case with the proper charge will be inserted in the breech, care being taken not to damage the case. Authority to fire the round will be obtained from the officer conducting fire.

43. **AMMUNITION.** Ammunition must be protected from damage, especially the rotating bands and cartridge cases. It is sorted and stored by lots. It is kept in containers as long as practicable. Whether in or out of containers, it is protected from dirt and ground moisture by being placed

on paulins or raised off the ground. It is protected from sun and rain by a paulin or other shelter placed above it. The powder temperature is kept uniform for any one lot; to permit free circulation of air, wood or brush is placed between layers of unboxed rounds. If time permits, trenches for ammunition will be dug to minimize the effects of a direct hit. The ammunition is stacked, with each stack containing not more than 75 rounds and being not more than four layers high. Stacks are at least 10 yards apart.

44. **SECTION DATA BOARD.** When positions are occupied for more than a few hours, each chief of section should maintain a section data board on which he records such items as base deflection, calibration corrections and standing corrections when appropriate, minimum range or elevation, data for primary defensive fire missions, and other data the need for which may be urgent.

CHAPTER 9

CARE AND ADJUSTMENT OF SIGHTING AND FIRE-CONTROL EQUIPMENT

45. **GENERAL.** Special care is required to insure the positive and accurate functioning of the sighting and fire-control mechanisms. Denting of the soft metal surfaces and scratching of the lenses must be prevented. The steel locating surfaces should be kept covered with a light film of lubricant to prevent corrosion. Dirt should be removed from optical surfaces by brushing lightly with a camel's-hair brush. Oil or grease should be removed from the glass by applying liquid lens soap or, if cleaning materials are not available, by breathing on the glass and then wiping lightly with lens paper. Battery personnel are forbidden to disassemble any part of the gunner's quadrant, panoramic or elbow telescopes, telescope mounts, or range quadrant, but are permitted to perform certain adjustments. The procedures described in paragraph 47 may be used to insure accuracy of the sighting and laying mechanisms. In general, the sighting and laying equipment is in adjustment when, with the tube and trunnions level, the lines (or planes) of sighting (vertical and horizontal) are parallel to the axis of the bore, all indexes and scales are zeroed (the site scale is zeroed at 3 (300), all other scales at zero), and the bubbles are centered or within the allowable error.

46. **EQUIPMENT FOR TESTING.** Equipment used in testing the sighting and laying equipment consists of bore sights, gunner's quadrant, a plate with parallel surfaces, and a testing target and plumb line. For adjustment, a 3-inch screw driver, a 5-inch heavy duty screw driver, an adjustable wrench, and a 9- to 16-inch socket wrench with handle are the only tools required. The target for boresighting may be a terrain object at least 1,000 yards away or a testing target between 50 and 100 yards in front of the tube. *Caution:* Care should be taken that the correct testing target is used,

since targets for use with different panoramic telescopes and extensions are not interchangeable. See TM 9–325 for information concerning proper displacement for the type sight and extension being tested.

47. TESTS AND ADJUSTMENTS. Tests and adjustments are performed before firing and during lulls in firing. Competent battery personnel may make the following tests and adjustments:

a. Gunner's quadrant. (1) *End-for-end test.* (*a*) Place the weapon in the center of traverse and level the trunnions to within 1 mil as in b (1) below.

(*b*) Set both the index arm and the micrometer scales at zero and match the auxiliary index marks (use black figures on micrometer).

(c) Place the quadrant on the leveling plates on the breech ring, using the arrow on the frame to indicate the direction of fire, and center the bubble of the quadrant by elevating or depressing the tube with the elevating handwheel.

(*d*) Reverse the quadrant on the leveling plates. (Turn it end for end.) The bubble should recenter itself. If it does not, center the bubble if possible by turning the micrometer. Take the reading on the micrometer, divide the reading by 2, and set the result on the micrometer. The result is the amount of the plus correction to be applied to the announced elevation. *Example:* The reading on the micrometer is 0.4 mil. The reading to be set on the micrometer is $0.4 \div 2 = 0.2$ mil.

If the bubble cannot be centered by use of the micrometer, it will be necessary to set a minus reading of one graduation (or -10 mils) on the graduated arc. The bubble can now be centered by turning the micrometer. Add the reading on the arc to the reading on the micrometer.

Example: Reading on arc $= -10$ mils; reading on micrometer $= 9.6$ mils. Disregard signs and add:

$10 + 9.6 = 19.6$ mils.

$19.6 \div 2 = 9.8$ mils, reading to be set on the micrometer. With this applied, place the quadrant back on the leveling

plates and center the bubble with the elevating handwheel. Turn the quadrant end for end; if the bubble recenters itself, the minus correction of —0.2 mil to be applied to the announced elevation has been determined. If the bubble fails to recenter itself, an error is indicated and the test must be repeated.

If the necessary correction exceeds 0.4 mil, the quadrant should be adjusted by ordnance personnel.

(2) *Micrometer test.* Set a reading of 10 mils on the graduated arc, set the micrometer at zero (using black figures), and center the bubble by elevating the tube. Turn the micrometer clockwise to a reading of 10 mils and set a reading of zero on the graduated arc. If the bubble does not center, there is an error in the micrometer and the quadrant should be adjusted by ordnance personnel.

b. Adjustment of on-carriage equipment. The on-carriage sighting and laying equipment is tested, and adjusted if necessary, *prior to firing,* to insure accurate laying of the piece for deflection and for elevation. The following steps should be taken to insure the desired accuracy:

(1) *Carriage.* In boresighting and testing, the trunnions should be leveled and the tube placed in the center of traverse. The trunnions should be leveled by leveling the ground under the trails or by blocking the lower trail to the height of the higher trail. The leveling of the trunnions should be checked with a tested gunner's quadrant (in conjunction with a machined steel plate or piece of plate glass) placed crosswise on the breech ring.

(2) *Telescope mount.* With the tube and trunnions level, place a steel or glass plate having parallel sides on top of the telescope mount. Level the telescope mount both crosswise and longitudinally by turning the cross leveling and elevation knobs, using the tested gunner's quadrant as a level. If the elevation indexes on the rocker and the actuating arm and those on the elevation knob and the shaft do not match, adjust them by moving the adjustable index on the rocker or by adjusting the elevation knob index as needed. If the cross and longitudinal level bubbles are not centered within one graduation, adjustment may be made by ordnance personnel.

(3) *Range quadrant.* (*a*) *Elevation scales.* Set the elevation scale to read zero. If the elevation micrometer does not read zero, loosen the screws in the knob and move the scale until the zero reading is opposite the index. Tighten the screws and recheck. The elevation scale index plate may be adjusted if necessary.

(*b*) *Angle of site scales.* Center the cross level and angle of site bubbles by using the cross leveling worm knob and the angle of site micrometer knob. If the angle of site scale does not read 3 (300), loosen the screws and move the scale until the figure 3 is in coincidence with the index. If the angle of site micrometer does not read zero, loosen the screw in the micrometer knob and move the scale until a zero reading is indicated. Recheck to make sure that the cross level and angle of site bubbles are centered and that the angle of site scales read 3 (300).

(4) *Boresighting.* Place the issue bore sights in their proper positions (or use improvised cross hairs on the muzzle and sight through the firing pin hole, making certain that the firing pin hole is actually centered when the breech is closed). Sight the tube on the testing target or a sharply defined distant aiming point. When using the testing target, move it into alignment with the bore sights, normal to the axis of the bore. When the tube is level, the testing target may be positioned normal to the axis of the bore by placing one of the vertical lines of the testing target diagrams parallel to a plumb line.

(5) *Panoramic telescope.* (*a*) *Deflection adjustment.* Place the panoramic telescope in the mount and check to see that the cross level and longitudinal level bubbles are centered. Set the azimuth micrometer index opposite the zero of the deflection scale. With the azimuth worm knob, place the vertical cross hair of the telescope reticle on the proper portion of the testing target or aiming point.

1. If the azimuth scale and the micrometer scale do not indicate zero deflection and the error is less than 50 mils, adjust in the following manner: turn the azimuth worm knob until the zero of the azimuth scale is opposite the index. Loosen the three screws in the azimuth micrometer knob

and, while holding the azimuth worm knob, slip the micrometer scale until the zero is opposite the micrometer index. Tighten the screws and recheck the scales for zero readings. Then loosen the tangent locking screws at the front of the telescope socket and adjust the tangent screws until the vertical cross hair is on the proper portion of the testing target or aiming point. Tighten the tangent locking screws and recheck.

2. If the error is greater than 50 mils, turn the azimuth worm knob until the vertical cross hair is on the proper portion of the testing target or aiming point. Then adjust the micrometer scale to read zero as above. If the azimuth scale does not now read zero, loosen the four screws on the collar above the scale and slip the scale around until the zero is opposite the index. Tighten the screws and recheck.

(*b*) *Elevation adjustment.* With the elevation knob, place the zero horizontal cross hair of the telescope reticle on the proper portion of the testing target or aiming point. If the elevation micrometer does not indicate zero, loosen the screws in the end of the knob, and, holding the knob, slip the elevation micrometer until the zero graduation lines up with its index; then tighten the screws and recheck the setting. If the coarse elevation index does not indicate zero, the adjustment should be made by ordnance personnel.

(*c*) *Prism alignment.* After adjusting the panoramic telescope on the testing target or distant aiming point, note carefully the position of the vertical and horizontal cross hairs on the target. Turn the rotating head through 6,400 mils, taking care not to go past 6,400. The vertical and horizontal cross hairs should be returned to exactly the same position on the target. Turn the rotating head 6,400 mils in the opposite direction, taking care not to go past 6,400. The cross hairs should coincide with the first noted position. If the cross hairs do not coincide after the rotating head has been turned 6,400 mils in either direction, the telescope should be returned to ordnance for adjustment.

(6) *Elbow telescope.* By observation, level the reticle with respect to the testing target or distant aiming point by means of the bracket rotating knob. If the N, or zero, range line does not match the line on the testing target or distant aiming point, loosen the worm clamping bolt and, with a screw driver, bring the N range line in coincidence with the proper line of the testing target or on the distant aiming point. Tighten the worm clamping bolt. Recheck alignment. No adjustment for deflection is provided.

CHAPTER 10

SECTION MAINTENANCE DRILL

48. GENERAL. **a.** Inspection and maintenance are essential to insure that the howitzer section is ready to move and to shoot at all times. Section drill on inspection and maintenance will make the work routine, thorough, and fast. This drill is applicable when the prime mover and the howitzer are close together.

b. The outline of duties in the section maintenance drill assigns duties to all members of the section. When the section is reduced in strength, the chief of section will assign duties to insure that all maintenance steps are completed.

c. The inspections and maintenance operations performed by the howitzer section are outlined in following paragraphs. Details of all preventive maintenance services are contained in the Technical Manuals of the particular equipment, and in appropriate War Department Lubrication Orders.

d. It is routine that all matériel and equipment be kept free from mud and dust at all times.

49. DUTIES IN INSPECTION BEFORE OPERATION.

a. Howitzer.

Chief of Section

1. Commands section; supervises loading coupling, and detailed inspection and maintenance.
2. Causes prime mover to be securely attached to the howitzer.
3. Inspects recoil system for signs of oil leakage.
4. Checks oil index to insure that a full reserve of oil is present in the recoil system. (See TM 9-325.)
5. Inspects ammunition for lot number, condition, and loading.
6. Checks loading of tools, accessories, and equipment for completeness and security.
7. Verifies presence of emergency supply of gasoline, oil, water, and rations.

Gunner

1. Verifies completeness of contents of section chest.
2. Releases left wheel hand brake.
3. Assists No. 1 in removing and replacing breech end of howitzer over-all cover.
4. Verifies presence and security of sighting and laying equipment. Tests and adjusts.
5. Checks position and fastening of shield.
6. Reports, "Gunner ready."

No. 1

1. Releases right wheel hand brake before coupling.
2. Assists gunner in removing and replacing breech end of howitzer over-all cover.
3. Opens breechblock; checks to see that bore is clean. Inspects breechblock, firing lock, and bore for cleanliness, lubrication, and freedom from foreign matter. Closes breechblock.
4. Inspects elbow telescope for condition and security.
5. Checks condition and fastening of trail traveling lock and latch.
6. Reports, "No. 1 ready."

No. 2

1. Checks condition and security of rammer staff.
2. Inspects blackout light connections.
3. Checks condition and security of trail handspike.
4. Checks presence and tightness of wheel and flange nuts on howitzer. Checks tire pressure and tire condition.
5. Verifies presence of ample supply of cleaning and preserving material.
6. Reports, "No. 2 ready."

49. DUTIES IN INSPECTION BEFORE OPERATION—Continued

a. Howitzer—Continued

Chief of Section

8. Verifies presence of Technical Manuals for prime mover and howitzer, trip ticket, Form 26, identification card, Lubrication Orders, and gun book.
9. Makes sure that gunner tests and adjusts sighting and laying equipment.
10. Receives reports from all members of the section as inspection is completed. Reports to battery executive, "Sir, No. (so-and-so) in order," or any defects which the section cannot remedy without delay or assistance.

Gunner

No. 1

No. 2

No. 3

1. Inspects howitzer overall cover for torn or worn places and for broken or missing fastenings.
2. Inspects drawbar to see that it is in proper position and securely locked.
3. Inspects carriage for loose parts, condition of tube fittings, and for cracked or broken welds.
4. Looks for grease and oil leakage on or under carriage.
5. Assisted by Nos. 4, 5, and 6, loads ammunition in prime mover.
6. Reports, "No. 3 ready."

No. 4

1. Assisted by No. 5, removes and replaces muzzle end of howitzer overall cover.
2. Inspects left axle lock for proper fastening in traveling position.
3. Inspects cradle lock strut for adjustment and fastening.
4. Checks left latch holding bottom shield flap in traveling position.
5. Inspects cradle traveling locks for adjustment.
6. Assists No. 5 in installing blackout lights on howitzer.
7. Cleans and oils rack and pinions.
8. Reports, "No. 4 ready."

No. 5

1. Assists No. 4 in removing and replacing muzzle end of howitzer overall cover.
2. Inspects right axle lock for proper fastening in traveling position.
3. Checks right latch holding bottom shield flap in traveling position.
4. Assists No. 4 in installing blackout lights on howitzer.
5. Checks condition and security of aiming posts on trails.
6. Inspects barrel locking ring and locking nuts for security.
7. Cleans and greases slides.
8. Reports, "No. 5 ready."

49. DUTIES IN INSPECTION BEFORE OPERATION—Continued

b. Prime mover. (1) Truck.

Chief of Section	*Driver*	*No. 6*	*No. 7*
1. Commands section. Supervises detailed inspection of prime mover.	1. Examines vehicle for tampering and damage since last operation. 2. Checks fuel tank, engine crankcase, and radiator. Replenishes fuel, oil, and water if necessary. 3. Checks accessories for condition, security of mounting, and connections. Checks drive belts for condition and tension. 4. Checks for leaks, locates source, and corrects or reports. 5. Observes starting action and idling speed during engine warm-up. Checks for abnormal noises. 6. Checks operation of choke while starting.	1. Examines vehicle for tampering and damage since last operation. 2. Checks fire extinguisher for presence, content, and proper mounting. 3. Checks charge and mounting of decontaminator. 4. Checks presence and tightness of wheel and flange nuts. 5. Checks general condition and pressure of tires. 6. Checks presence, condition, and operation of headlights, taillights, blackout lights, stop lights, and reflectors on howitzer and prime mover. (Driver operates switches.)	1. Examines vehicle for tampering and damage since last operation. 2. Checks for leaks, locates source, and corrects or reports. 3. Checks all parts of steering linkage for condition and security. 4. Checks condition and attachment of springs and suspension. 5. Checks mounting and condition of fenders and bumpers. 6. Checks mounting and locking devices of towing connections. 7. Checks body, load, and tarpaulin for condition and attachment. 8. Reports, "No. 7 ready."

Resets as required during the warm-up.

7. Checks dash instruments and gauges for correct readings.
8. Checks operation, condition, and mounting of horn and windshield wiper.
9. Cleans and inspects glass and rearview mirrors. Adjusts mirrors.
10. Operates switch while No. 6 checks lights.
11. Verifies possession of driver's permit. Checks vehicle for Technical Manual, lubrication order, trip ticket, Form 26, and identification card.
12. Checks engine during operation for sound and general condition during idle, acceleration, and deceleration.
13. Reports, "Driver ready."

7. Checks tools and equipment for presence, condition, and mounting.
8. Reports, "No. 6 ready."

49. DUTIES IN INSPECTION BEFORE OPERATION—Continued

b. Prime mover—Continued. (2) Tractor.

Chief of Section	*Driver*	*No. 6*	*No. 7*
1. Commands section. Supervises detailed inspection of prime mover.	1. Examines vehicle for tampering and damage since last operation. 2. Checks fuel tank, engine crankcase and radiator, air compressor, transmission, and final drives. Replenishes fuel, oil, and water if necessary. 3. Checks accessories and drives for condition, security of mounting, and connections. Checks drive belts for condition and tension. Also checks oil levels and replenishes where necessary. 4. Inspects for leaks, locates source, and corrects or reports. 5. Observes engine starting action and idling speed. Checks engine oil pressure. Checks for abnormal operational noises.	1. Examines vehicle for tampering and damage since last operation. 2. Checks fire extinguisher for condition and proper mounting. Makes sure that seal wire is not broken. 3. Checks charge and mounting of decontaminator. 4. Operates switch while No. 7 checks lights. 5. Checks air brake tanks for security and condition. Closes tank drain valves. 6. Cleans, inspects, and adjusts glass and rearview mirrors. 7. Inspects body, load, and tarpaulin for condition and attachment. 8. Checks presence, condition, and mounting of tools and equipment. 9. Reports, "No. 6 ready."	1. Examines vehicle for tampering and damage since last operation. 2. Checks presence, condition, and operation of headlights, taillights, blackout lights, and reflectors on prime mover and howitzer. 3. Inspects for leaks, locates source, and corrects or reports. 4. Insures that all nuts and cap screws on sprockets, bogie wheels, idlers, and track support rollers are in place and secure. 5. Checks bogie tires for cuts and imbedded stones and trash. Checks tracks for dead blocks, loose and bottomed wedges, and track tension. 6. Inspects springs for

6. Checks choke and primer operation while starting. Resets as required during the warm-up. In cold weather, checks operation of primer.
7. Checks instruments for correct readings: fuel gauge, engine oil pressure gauge, coolant temperature gauge, tachometer, hour meter, air pressure gauge, and low air pressure warning buzzer.
8. Checks siren and windshield wiper operation, condition, and mounting.
9. Checks steering lever free travel, pull back, and lever lock operation.
10. Checks engine idle, acceleration, and deceleration.
11. Verifies possession of driver's permit. Checks vehicle for Technical Manuals, lubrication order, trip ticket, Form 26, and identification card.
12. Reports, "Driver ready."

breakage and permanent set. Cleans out debris in suspension system. Checks for loose or broken parts.
7. Checks mounting and condition of fenders and bumpers.
8. Checks mounting and locking devices of towing connections.
9. Inspects body, load, and tarpaulin for condition and attachment.
10. Checks condition and mounting of winch.
11. Reports, "No. 7 ready."

50. DUTIES IN INSPECTION DURING MARCH.

a. Truck-drawn units.

Chief of Section

1. Rides in cab with driver and supervises march discipline.
2. Assigns duties to Nos. 1 to 6 as antitank and antiaircraft sentries.
3. Checks prime mover instruments and controls for proper functioning.
4. Listens for noises indicating malfunction of matériel.

Gunner

1. Observes prime mover for security. Signals driver if load or parts become loose.

Nos. 1 to 6

1. Listen for noises indicating malfunction of matériel.
2. Perform duties as antitank and antiaircraft sentries as assigned by chief of section.

No. 7

1. Observes towed load for security. Signals driver if load or parts become loose.

Driver

1. Checks foot and hand brakes for effective operation.
2. Checks steering for effective operation. Checks for pull, wander, and shimmy.
3. Checks clutch for free travel and smooth operation.
4. Checks transmission for proper operation.
5. Checks transfer for proper operation.
6. Checks operation of controls. Checks noises and "feel" for general engine condition.
7. Checks reading and action of all instruments and gauges.
8. Listens for noises indicating malfunction of vehicle.

b. Tractor-drawn units.

Chief of section

1. Supervises march discipline.
2. Assigns duties to Nos. 1 to 5 as antitank and antiaircraft sentries.
3. Checks prime mover instruments and controls for proper functioning.
4. Listens for noises indicating malfunction of matériel.

Gunner

1. Observes prime mover for security. Signals driver if load or parts become loose.

Nos. 1 to 5

1. Listen for noises indicating malfunction of matériel.
2. Perform duties as antitank and antiaircraft sentries as assigned by chief of section.

No. 6

1. Observes towed load for security. Signals driver if load or parts become loose.

Driver

1. Checks steering brake action. Checks lever free travel.
2. Checks clutch pedal operation. Checks for abnormal noises.
3. Checks for proper transmission operation.
4. Checks operation of engine and controls. Checks noises and "feel" for general condition of engine.
5. Checks reading of all instruments and gauges.
6. Listens for abnormal noises in running gear.
7. Checks for listing of tractor and side pull of towed load.

51. DUTIES IN INSPECTION DURING HALT.

a. Howitzer.

Chief of Section

1. Supervises inspection and maintenance at halt. Sees that personnel remain inside left wheel line except to inspect left wheels. Receives reports.
2. Reports, "Sir, No. (so-and-so) in order," or deficiencies that cannot be corrected.

Gunner

1. Checks condition and security of sighting equipment.
2. Checks condition and security of section chest.
3. Reports, "Gunner ready."

No. 1

1. Inspects breech end of howitzer over-all cover for security.
2. Inspects trail traveling lock and latch for condition and fastening.
3. Inspects black out light cable connections.
4. Checks condition and security of rammer staff.
5. Reports, "No. 1 ready."

No. 2

1. Checks tires for bruises, cuts, and stones in treads. Checks nuts for security. Inspects to see that tires are properly inflated. Checks for hot wheel bearings.
2. Inspects loading of cleaning and preserving materials and checks for leakage.
3. Checks trail hand-spike for condition and security.
4. Reports, "No. 2 ready."

No. 3

1. Inspects muzzle end of howitzer over-all cover.
2. Checks to see that drawbar is in proper position and securely locked.
3. Reports, "No. 3 ready."

No. 4

1. Inspects axle locks for proper fastening.
2. Inspects cradle lock strut for proper fastening.
3. Checks bottom shield flap for security in traveling position.
4. Reports, "No. 4 ready."

No. 5

1. Checks condition and security of aiming posts.
2. Checks condition and security of black-out light.
3. Reports, "No. 5 ready."

b. Prime mover. (1) Truck.

Chief of Section

1. Supervises inspection and maintenance at halt.

Driver

1. Checks and replenishes supply of fuel, oil, and water.
2. Checks air cleaners for secure mounting. Cleans if necessary.
3. Checks mounting, adjustment, and operation of accessories and belts.
4. Cleans and inspects lights, reflectors, windshield, and rearview mirrors. Inspects vehicle for damage.
5. Reports, "Driver ready."

No. 6

1. Checks transfer, transmission, axles, and center bearing for overheating and leaks.
2. Checks presence and condition of axle and transfer vents.
3. Checks for leaks, locates source, and corrects or reports.
4. Checks condition and lubrication of propeller shafts. Removes any foreign material.
5. Reports, "No. 6 ready."

No. 7

1. Checks brake drums and wheel hubs for overheating and leaks.
2. Checks condition of tires. Removes foreign objects.
   Checks tire pressure.
3. Checks presence and tightness of wheel and flange nuts.
4. Checks steering linkage for loose or damaged parts.
5. Checks springs and suspensions for loose or damaged parts.
6. Checks mounting and condition of fenders and bumpers.
7. Inspects pintle mounting and locking devices.
8. Checks body and tarpaulin for condition. Checks load for shifting.
9. Reports, "No. 7 ready."

51. DUTIES IN INSPECTION DURING HALT—Continued

b. Prime mover—Continued. (2) Tractor.

Chief of section

1. Supervises inspection and maintenance at halt. Receives reports from driver and No. 6 on condition of prime mover.

Driver

1. Checks and replenishes fuel, oil, and water supply.
2. Checks steering linkage for loose or damaged parts. Checks lever free travel.
3. Checks for leaks, locates source, and corrects or reports.
4. Checks mounting, adjustment, and operation of accessories and belts.
5. Checks air cleaners for secure mounting. Cleans if necessary. Cleans crankcase breather if necessary.
6. Checks condition of vents.
7. Inspects for damage. Cleans glass.
8. Reports, "Driver ready."

No. 6

1. Feels the sprocket hub, final drives, idler wheel hubs, bogie wheel hubs, and track support rollers to see if they are abnormally hot.
2. Checks for leaks, locates source, and corrects or reports.
3. Examines springs for breaking or sagging. Cleans out trash from suspension system.
4. Checks presence and tightness of wheel and flange nuts.
5. Checks condition of tires and tracks. Checks track tension. Removes foreign objects.

52. DUTIES IN INSPECTION DURING FIRING.

a. Howitzer.

Chief of section	*Gunner*	*No. 1*	*Nos. 2 to 7*
1. Supervises section in firing in accordance with chapter 7. 2. Supervises sight tests and adjustments before firing.	1. Tests and adjusts sighting and laying equipment. 2. Performs duties as prescribed in chapter 7.	1. Tests and adjusts elbow telescope. 2. Performs duties as prescribed in chapter 7.	1. Performs normal duties as prescribed in chapter 7 and any other duties prescribed by chief of section.

b. Prime mover. (1) The driver will move his prime mover to the motor park and there inspect all of the items listed in paragraph 53b (1) or (2).

(2) Normally the driver will assist the motor sergeant and motor mechanics in the performance of all maintenance services on his vehicle. See TM 37–2810 and 9–801 (truck-drawn unit), or TM 9–786 (tractor-drawn unit).

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53. DUTIES IN INSPECTION AND MAINTENANCE AFTER OPERATION.

a. Howitzer.

Chief of section

1. Supervises detailed inspection and maintenance of howitzer.
2. Checks tools, accessories, and equipment for completeness and condition.
3. Inspects ammunition for lot number, complete rounds, and general condition.
4. Inspects recoil system for signs of leakage and supervises establishing correct oil reserve (TM 9-325).
5. Verifies presence of and current entries in gun book, trip ticket, etc.
6. Verifies resupply of emergency rations, oil, water, and gasoline.

Gunner

1. Verifies presence and cleans and secures sighting and laying equipment.
2. Inspects bore after cleaning.
3. Assists No. 1 in removing and replacing breech end of howitzer overall cover.
4. Verifies completeness of contents of section chest.
5. Reports, "Gunner ready."

No. 1

1. Assists gunner in removing and replacing breech end of howitzer overall cover.
2. Removes, cleans, lubricates, and replaces breechblock and firing lock.
3. Reports, "No. 1 ready."

No. 2

1. Removes, cleans, and replaces rammer staff.
2. Inspects wheels for loose or missing parts, and tires for pressure, cuts, and bruises.
3. Removes, cleans, and stores blackout light equipment in section chest.
4. Inspects fastenings of shields.
5. Assists Nos. 3, 4, and 5 in cleaning howitzer and carriage.
6. Reports, "No. 2 ready."

7. Receivers reports from members of the section as they complete inspection.
8. Reports to battery executive, "Sir, No. (so-and-so) in order."

No. 3

1. Assists Nos. 2, 4, and 5 in cleaning howitzer and carriage.
2. Using lubrication order, assists No. 4 in lubrication of howitzer.
3. Inspects carriage for loose or missing nuts, rivets, or broken welds; looks for excess grease or oil under carriage.
4. Cleans, lubricates, and returns fuze setter to section chest.
5. Reports, "No. 3 ready."

No. 4

1. Assists No. 5 in removing and replacing muzzle end of howitzer overall cover.
2. Assists No. 3 in lubrication.
3. Assists Nos. 2, 3, and 5 in cleaning howitzer and carriage.
4. Reports, "No. 4 ready."

No. 5

1. Assists No. 4 in removing and replacing muzzle end of howitzer overall cover.
2. Assists Nos. 2, 3, and 4 in cleaning howitzer and carriage.
3. Properly stores unused cleaning and preserving materials.
4. Removes, cleans, lubricates, and returns aiming posts.
5. Reports, "No. 5 ready."

53. DUTIES IN INSPECTION AND MAINTENANCE AFTER OPERATION—Continued.

b. Prime mover. (1) Truck.

Chief of section	*Driver*	*No. 6*	*No. 7*
1. Commands section. Supervises detailed inspection of prime mover.	1. Checks and replenishes supply of fuel, oil, and water. 2. Checks engine operation at idle and during acceleration and deceleration. 3. With engine running, checks operation, condition, and mounting of instruments. 4. Checks operation, connections, and mountings of horn and windshield wipers. 5. Cleans and inspects glass and rearview mirrors. Adjusts mirrors. 6. Operates switches while No. 6 checks lights. 7. Checks all accessories for mounting and condition. Checks all belts for condition and adjustment.	1. Checks contents, cleanliness, and mounting of fire extinguishers. 2. Checks charge and mounting of decontaminator. 3. Checks condition and air pressure of tires. Removes foreign objects. 4. Checks presence, condition, and operation of lights, reflectors, and switches. (Driver operates switches.) 5. Checks wheels, rims, axle drive flanges, and spring U-bolt nuts for loose or missing parts. Tightens as needed. 6. Checks condition and security of propeller shafts, center bearings, and vents. Removes any foreign material.	1. Checks fluid leaks, locates source, and corrects or reports. 2. Checks all gear cases for lubricant level. Reports if low. 3. Inspects body, load, and tarpaulins for security and condition. 4. Checks condition and attachment of springs and suspensions. 5. Checks mounting and condition of fenders and bumpers. 6. Checks all parts of steering linkage for condition and security. 7. Checks pintle mounting and locking device. 8. Assists No. 6 in cleaning vehicle. 9. Assists driver in lubricating vehicle.

8. Checks mounting, condition, cleanliness, and electrolyte level of the battery. Cleans if necessary.
9. Checks accessible wiring for connections and condition.
10. Checks and cleans air cleaners and breather caps if necessary.
11. Drains accumulated water and dirt from fuel filters.
12. Checks condition and operation of engine controls.
13. Cleans engine thoroughly.
14. Lubricates vehicle as needed and as directed by vehicle lubrication order.
15. Checks winch for looseness or damage and excessive oil leaks. Assisted by Nos. 6 and 7, cleans, inspects, and rewinds cable if winch has been used during day.
16. Reports, "Driver ready."

7. Checks condition and cleanliness of axle and transfer vents.
8. Checks presence, condition and mounting of tools and equipment.
9. Cleans vehicle thoroughly, assisted by No. 7.
10. Assists driver in lubricating vehicle.
11. Assists driver in servicing winch.
12. Reports, "No. 6 ready."

10. Assists driver in servicing winch.
11. Reports, "No. 7 ready."

53. DUTIES IN INSPECTION AND MAINTENANCE AFTER OPERATION—Continued.

b. Prime mover (2) Tractor.

Chief of Section	*Driver*	*No. 6*	*No. 7*
1. Commands section. Supervises detailed inspection of prime mover.	1. Checks fuel, oil, and water, and replenishes if necessary. 2. Observes engine operation at idle and during acceleration and deceleration. 3. Checks operation, condition, and mounting of instruments while engine is running. 4. Checks for leaks, locates source, and corrects or reports. 5. Checks all accessories for mounting and condition. Checks all belts for condition and adjustment. 6. Checks accessible electrical wiring for connections, condition, insulation, and shielding.	1. Cleans fire extinguisher nozzle; checks seal and mounting. 2. Inspects decontaminator for condition, charge, and mounting. 3. Operates switches while No. 7 checks lights. 4. Checks operation, connections, and mounting of siren and windshield wipers. 5. Cleans glass and rear-view mirrors; inspects mounting. 6. Gives handle at top of fuel filter two turns. 7. Checks condition of vents. 8. Checks air brakes for leaks. Checks connections and mounting. Drains air tanks and air separator.	1. Checks tow hooks and pintle condition and mounting. Checks locking devices. 2. Checks operation of headlights, taillights, and reflectors; cleans. (No. 6 operates switch.) 3. Inspects for leaks, locates source, and corrects or reports. 4. Examines bogie tires for cuts and separation from wheels. Checks for loose, bent, and worn connectors Checks track tension. 5. Checks springs and suspensions for bent, broken, or loose parts. Removes all stones and trash.

7. Checks and cleans breathers and air cleaners if necessary.
8. Checks battery mounting, condition, cleanliness, and electrolyte level. Cleans if necessary.
9. Checks engine controls. Corrects damaged linkage; corrects for improper operation.
10. Checks steering lever free travel and steering linkage for loose or broken parts.
11. Lubricates as needed and as prescribed by vehicle lubrication order.
12. Checks winch for looseness or damage and excessive oil leaks. If winch has been used during day, cleans, inspects, and rewinds winch cable, assisted by Nos. 6 and 7.
13. Cleans engine and vehicle, assisted by Nos. 6 and 7.
14. Reports, "Driver ready."

9. Checks body, load, and tarpaulin, for condition and attachment.
10. Verifies presence, cleans, and stows tools and equipment.
11. Helps No. 7 examine bogie tires for cuts and separation from wheels. Checks for loose, bent, and worn connectors. Checks track tension.
12. Checks gear oil levels. Replenishes if necessary, as prescribed by lubrication order.
13. Tightens loose nuts and cap screws.
14. Assists driver in cleaning engine and vehicle.
15. Reports, "No. 6 ready."

6. Checks mounting and condition of fenders and bumpers.
7. Assists driver in lubricating as needed and as prescribed by lubrication order.
8. Assists No. 6 in tightening loose nuts and cap screws.
9. Assists driver in cleaning engine and vehicle.
10. Reports, "No. 7 ready."

54. DUTIES IN WEEKLY INSPECTION AND MAINTENANCE.

a. Howitzer.

Chief of section

1. Supervises section in weekly inspection and maintenance of howitzer, tools, accessories, and equipment. (See TM 9-325 and howitzer lubrication order.)
2. Receives reports.

Gunner; Nos. 1 to 5

1. Perform normal care and cleaning as directed by the chief of section.

b. Prime mover. (1) Truck.

Chief of section

1. Commands section. Supervises detailed inspection of prime mover. (See TM 9-801 and vehicle lubrication order.)

Driver

1. Checks and replenishes supply of fuel, oil, and water. Checks the antifreeze with hydrometer.
2. Checks engine operation at idle and during acceleration and deceleration.
3. With engine running, checks operation, condition, and mounting of instruments.
4. Checks operation, connections, and mounting of horn and windshield wiper.

No. 6

1. Checks contents, cleanliness, and mounting of fire extinguisher.
2. Checks charge and mounting of decontaminator.
3. Checks tires for air pressure; removes all foreign matter. Checks for proper matching and irregular wear, and changes position of tires as required. Removes and replaces any badly injured tires.

No. 7

1. Checks for leaks, locates source, and corrects or reports.
2. Checks all gear cases for lubricant levels and leaks. Reports if low.
3. Checks condition of body and tarpaulin.
4. Checks condition and attachment of springs and suspensions. Corrects or reports any abnormal conditions.
5. Checks mounting and condition of fenders and bumpers.

5. Cleans and inspects glass and rearview mirrors. Adjusts mirrors.
6. Operates switches while No. 6 checks lights.
7. Checks accessories and tightens mountings. Checks all belts for condition and adjustment.
8. Cleans battery; checks electrolyte level and specific gravity. Checks battery mounting, replaces battery, and tightens terminals securely.
9. Checks all wiring to see that it is securely connected, clean, and not damaged.
10. Removes and cleans all air cleaners and breather caps.
11. Drains accumulated water and dirt from fuel filters.

4. Checks all lights, light switches, and reflectors for condition and operation. (Driver operates switches.)
5. Checks wheels, rims, axle drive flanges, and spring U-bolts for loose or missing parts.
6. Checks condition and security of propeller shafts, center bearings, and vent. Removes any foreign material.
7. Checks condition and cleanliness of axle and transfer vents. Cleans all vents thoroughly.
8. Checks and tightens nuts and bolts, assisted by No. 7.
9. Checks presence and condition of tools and equipment. Reports missing or damaged tools.

6. Checks all parts of steering linkage for security, condition and adjustment.
7. Checks pintle mounting and locking device. Tightens mounting bolts.
8. Assists No. 6 in checking and tightening nuts and bolts.
9. Assists No. 6 in cleaning vehicle thoroughly.
10. Assists driver in lubricating vehicle.
11. Assists driver and No. 6 in service of the winch.
12. Reports, "No. 7 ready."

54. DUTIES IN WEEKLY INSPECTION AND MAINTENANCE—Continued

b. Prime mover. (1) Truck—Continued

Driver	*No. 6*	*No. 7*
12. Checks condition and operation of engine controls. Corrects malfunctioning.	10. Cleans vehicle thoroughly, assisted by No. 7. Washes if possible.	
13. Cleans engine thoroughly.	11. Assists driver in lubricating vehicle.	
14. Lubricates vehicle as directed by vehicle lubrication order.	12. Assists driver and No. 7 in service of the winch.	
15. Checks winch for looseness or damage and excessive oil leaks. Assisted by Nos. 6 and 7, inspects, cleans, and rewinds cable. Corrects or reports all abnormal conditions.	13. Reports, "No. 6 ready."	
16. Reports, "Driver ready."		

(2) Tractor.

Chief of Section	*Driver*	*No. 6*	*No. 7*
1. Commands section. Supervises detailed inspection of prime mover. (See TM 9-786 and vehicle lubrication order.)	1. Checks fuel, oil, and water, and replenishes if necessary. 2. Observes engine operation at idle and during acceleration and deceleration. 3. Checks operation, condition, and mounting of instruments while engine is running. 4. Assisted by No. 7, checks for leaks, locates source, and corrects or reports. 5. Checks all accessories for mounting and condition. Tightens or adjusts mountings as required. Checks all belts for condition. Adjusts belts as required.	1. Cleans fire extinguisher nozzle; checks seal and mounting. 2. Inspects decontaminator for condition, charge, and mounting. 3. Operates switches while No. 7 checks lights. 4. Checks operation, connections, and mounting of siren and windshield wiper. 5. Cleans glass and rear-view mirrors; inspects mounting. 6. Gives handle at top of fuel filter two turns. Drains sediment at base of cleaners. Checks line connections and mountings. 7. Inspects vents and vent pipes for clear openings.	1. Checks tow hooks, pintle condition and mounting. Checks locking devices. Tightens mounting. 2. Checks operation of headlights, taillights, and reflectors; cleans. (No. 6 operates switch.) 3. Inspects for leaks, locates source, and corrects or reports. 4. Assists No. 6 in servicing tires and tracks. 5. Checks springs and suspensions for bent, broken, or loose parts. Removes all stones and trash. Tightens nuts and cap screws. 6. Checks mounting and condition of fenders and bumpers. 7. Assists driver in lubricating as necessary and as prescribed by lubrication order.

54. DUTIES IN WEEKLY INSPECTION AND MAINTENANCE—Continued

b. Prime mover. (2) Tractor—Continued

Chief of Section	*Driver*	*No. 6*	*No. 7*
	6. Checks ignition wiring. Checks all accessible wire, looms, junction blocks, and conduits, for breaking and chafing.	8. Checks air brakes for leaks. Checks all lines, connections, and mountings. Drains air tank and air separator.	8. Assists No. 6 in tightening loose nuts and cap screws.
	7. Cleans and services air cleaner lower screen and oil cup, crankcase breather air cleaner, and engine air cleaner.	9. Checks body, load, and tarpaulin for condition and attachment.	9. Assists driver in cleaning engine and vehicle. If possible, washes vehicle.
	8. Cleans battery and battery box as necessary. Checks electrolyte level and adds water as needed. Tightens terminal and hold-down nuts.	10. Verifies presence, cleans, and stows tools and equipment. Checks tools and equipment with vehicle stowage lists. (See TM 9-786.)	10. Assists driver in service of the winch.
	9. Checks engine controls. Corrects damaged linkage; corrects for improper operation.	11. Assisted by No. 7, inspects bogie tires for cuts and separation from wheels. Checks for loose, bent, or worn connectors. Checks track tension. Tightens wedge nuts and checks for dead blocks and bottomed wedges. Notes leaky seals on bogie wheels.	11. Reports, "No. 7 ready."
	10. Checks steering lever free travel, and steering linkage for loose or broken parts.		

11. Assisted by No. 7, lubricates as necessary and as prescribed by vehicle lubrication order.
12. Assisted by Nos. 6 and 7, cleans engine and vehicle. If possible, washes vehicle.
13. Checks winch for looseness or damage and excessive oil leaks. Assisted by Nos. 6 and 7, inspects, cleans, and rewinds cable. Corrects or reports all abnormal conditions.
14. Reports, "Driver ready."

12. Checks gear oil levels. Replenishes if necessary as directed by lubrication order.
13. Tightens loose nuts and cap screws.
14. Assists driver in cleaning engine and vehicle. If possible, washes vehicle.
15. Assists driver in service of the winch.
16. Reports, "No. 6 ready."

CHAPTER 11

DECONTAMINATION AND DESTRUCTION OF EQUIPMENT

Section I. DECONTAMINATION

55. GENERAL. a. Whenever chemical attacks are anticipated, cover all unpainted surfaces with oil. Keep propelling charges, fuzes, and primers in sealed containers, and cover projectiles with a paulin.

b. After a gas attack, remove the oil with dry-cleaning solvent, using rags attached to sticks. Decontaminate painted surfaces with a mixture of equal parts by weight of decontaminating agent (chloride of lime) and water. If chloride of lime is not available, use large quantities of hot water.

56. AFTER EXPOSURE TO VESICANT GAS. Unpainted surfaces exposed to *vesicant gas* (mustard or lewisite) must be treated with a mixture of 1 part agent, decontaminating, noncorrosive, and 15 parts solvent (acetylene tetrachloride) by weight. If these materials are not available, wash the unpainted surfaces with warm water and soap several times. Clean ammunition the same way. ***Caution:*** Do not use dry chloride of lime near ammunition. Flaming occurs when it touches liquid vesicants.

57. AFTER EXPOSURE TO NONVESICANT GAS. Unpainted surfaces exposed to *nonvesicant gas* may be cleaned with solvent or denatured alcohol, wiped dry, and then coated with oil. (See TM 3–220 for further information on decontamination.)

Section II. DESTRUCTION

58. GENERAL. a. When capture by the enemy is imminent, matériel will be destroyed. Such destruction is a command decision *to be carried out only on authority delegated by the division or higher commander.* All howitzer batteries will prepare plans for destroying their matériel. Plans must be flexible in the time, equipment, and personnel required.

b. Training will not involve actual destruction of matériel, but will stress that—

(1) Matériel will be destroyed only when such action is necessary in the judgment of the military commander concerned. (See a above.)

(2) The sequence laid down for the method selected will be strictly followed, to insure uniform destruction.

(3) *The same essential parts will be destroyed on all weapons or vehicles to prevent the enemy from reconstructing a complete weapon or vehicle from several damaged ones.*

c. Some methods require special tools and equipment not normally items of issue. Special issue of such items is a command decision. If magneto exploders are not available, the generator of a standard field telephone can furnish current for tetryl electric blasting caps. With nonelectric blasting caps, at least 5 feet of Bickford safety fuze must be used to allow personnel firing to reach cover. See FM 5–25 on demolition charges.

d. Methods are given in the order of their effectiveness. Use method No. 1 where possible, other methods in the priority shown.

59. OPTICAL AND FIRE CONTROL EQUIPMENT. Remove all detachable equipment before destroying the rest of the weapon. *If evacuation is possible, carry detachable items* and thoroughly smash nondetachable items. If evacuation is not possible, thoroughly smash all optical equipment and burn slide rules, firing tables, charts, etc.

60. TUBE, BREECH, RECOIL MECHANISM, AND CARRIAGE. When simultaneous destruction of all these items is impossible, destruction of the tube, breech, and recoil mechanism has priority.

a. Method No. 1. (1) Start draining oil by inserting oil release in filling hole in recuperator cylinder front head.

(2) Place *armed* (safety pin removed) antitank grenade, or *armed* (safety pin removed) antitank rocket in tube about 21 inches forward of forcing cone, ogive end toward breech.

(3) Load piece with HE round, unfuzed if possible. Do not use HE antitank shell.

(4) Fire piece from fox hole at least 100 feet to rear, about 20° off line of fire. Elapsed time: 2 to 3 minutes. Danger zone: 500 yards.

b. Method No. 2. (1) Insert four ½-pound blocks of TNT in tube near muzzle, nine in chamber. Close breechblock as far as possible without damaging safety fuze.

(2) Plug muzzle tightly with earth for 12 inches. If plugging is not possible, insert more TNT blocks.

(3) Place two unfuzed HE shells, with booster left in place, upright on top of carriage just below cradle between elevating arcs. Cover each fuze opening with ½ pound of TNT. Ten ½-pound blocks of TNT may be substituted for HE shells.

(4) Detonate all charges simultaneously, using detonating cord, tetryl nonelectric caps, and at least 5 feet of safety fuze. Electric detonation methods may be used if available. Danger zone: 500 yards.

c. Method No. 3. (1) Fire one howitzer at the others from position 200 yards distant. Use HE or HE antitank shell. Two or more hits on a vital spot should suffice.

(2) Destroy last howitzer and carriage by best means available.

(3) Enemy salvage of some parts is probable with this method.

d. Method No. 4. (1) With tube near zero elevation, insert four unfuzed incendiary grenades end to end midway in tube and close breech.

(2) Ignite another incendiary grenade equipped with a 15-second Bickford fuze, toss it in the muzzle, and elevate tube quickly to its maximum elevation.

(3) Destroy remaining parts by other means. Elapsed time: 2 to 3 minutes.

61. PNEUMATIC TIRES. Tires must always be destroyed, even when time is lacking to destroy the remainder of the weapon or vehicle.

a. Method No. 1. Ignite an incendiary grenade under each tire. If used in combination with carriage or vehicle destruction by explosives, incendiary fires must be well started before charges are detonated.

b. Method No. 2. Deflate tires. Damage with ax,

pick, or fire from heavy machine gun. Pour gasoline on tires and ignite.

62. **AMMUNITION.** Adequate destruction of a full battery load takes 30 to 60 minutes. See TM 9–1900 and 9–1901 for safety precautions.

a. **Method No. 1.** (1) Stack ammunition in small piles. If time permits, remove complete rounds from containers and propelling charges from cartridge cases.

(2) Stack drums or cans of gasoline around piles. Throw on any available rags, scrap wood, brush, or other inflammable material to insure a very hot fire.

(3) Pour gasoline on piles, ignite, and take cover.

b. **Method No. 2.** Unpack complete rounds, stack in two stacks 3 inches apart, fuzes facing each other. Place TNT between stacks, at least 1 pound for each four rounds. Detonate all TNT simultaneously from cover.

63. **VEHICLES.** a. **Method No. 1.** (Time: 1 to 2 minutes, with charges prepared in advance and carried in vehicle. If prepared charges are carried in vehicle, *keep caps and fuzes separated from charges until used.*) Remove and empty fire extinguishers. Puncture fuel tanks. Place TNT charges as indicated in the table below. Insert tetryl nonelectric caps with at least 5 feet of safety fuze in each charge. Ignite the fuzes and take cover.

Vehicle	Pounds TNT	Where placed
Medium tractor and M5 (Smash generator, starting motor, and carburetor before placing charges.)	2	Against center of engine block at base of distributor shaft.
	2	At flange joining transmission and differential housing.
	1	Top of tracks at midpoint.
	1	On bogie suspension assembly.
Trailers	2	Over axle inside each wheel.
Trucks	2	Top of clutch housing. Open hood to place charge properly.
	2	Left side of engine, low as possible.

b. **Method No. 2.** (Time: 5 to 8 minutes.) Remove and empty fire extinguishers. Puncture fuel tanks. Open all doors and hatches. Fire on vehicle with artillery, rockets, or grenades. Aim at engine, suspension, and armament in that order. If a good fire is started, vehicle may be considered destroyed.

c. **Method No. 3.** Choose appropriate variation.

(1) When vehicle contains enough fuel to insure rapid burning, use small-arms fire or pioneer tools to puncture in sequence: crankcase oil pan, radiator tank and core, oil filter. Start engine and let it race with hand throttle open full. Remove and empty fire extinguishers. Puncture bottom of gasoline tank and drench tires, cargo, cab interior, and engine with gasoline in order named. Ignite fuel from windward side. (Time: 15 to 45 minutes.)

(2) Puncture with small-arms fire or pioneer tools, in sequence: crankcase oil pan, radiator tank and core, oil filter, tires. Start engine and let it race with hand throttle open full. (Time: 5 to 12 minutes.)

(3) With pioneer tools or rifle butt smash or puncture in sequence: distributor cap and housing, ignition coil, carburetor, intake and exhaust manifolds, fuel pump, radiator tank and core, battery, and fuel tank. If flame and smoke will give no information to enemy, ignite fuel. (Time: 3 to 5 minutes.)

d. **Method No. 4.** Drive to edge of bluff or ravine, let engine race, and push vehicle over edge. For more thorough destruction, smash additional vehicles on same pile at bottom.

Note. Whenever practicable, execute the following destruction before proceeding with other methods of destruction: smash or puncture generator, starting motor, distributor cap and housing, ignition coil, fuel pump, fuel tank, crankcase oil pan, radiator tank and core, battery, and carburetor.

INDEX